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ALPHABETICAL CONTENTS

BOSTON MEDICAL LIBRARY ASS'N. MAR 28 1894

OF THE

BACTERIOLOGICAL WORLD

AND

MODERN MEDICINE.

1892.

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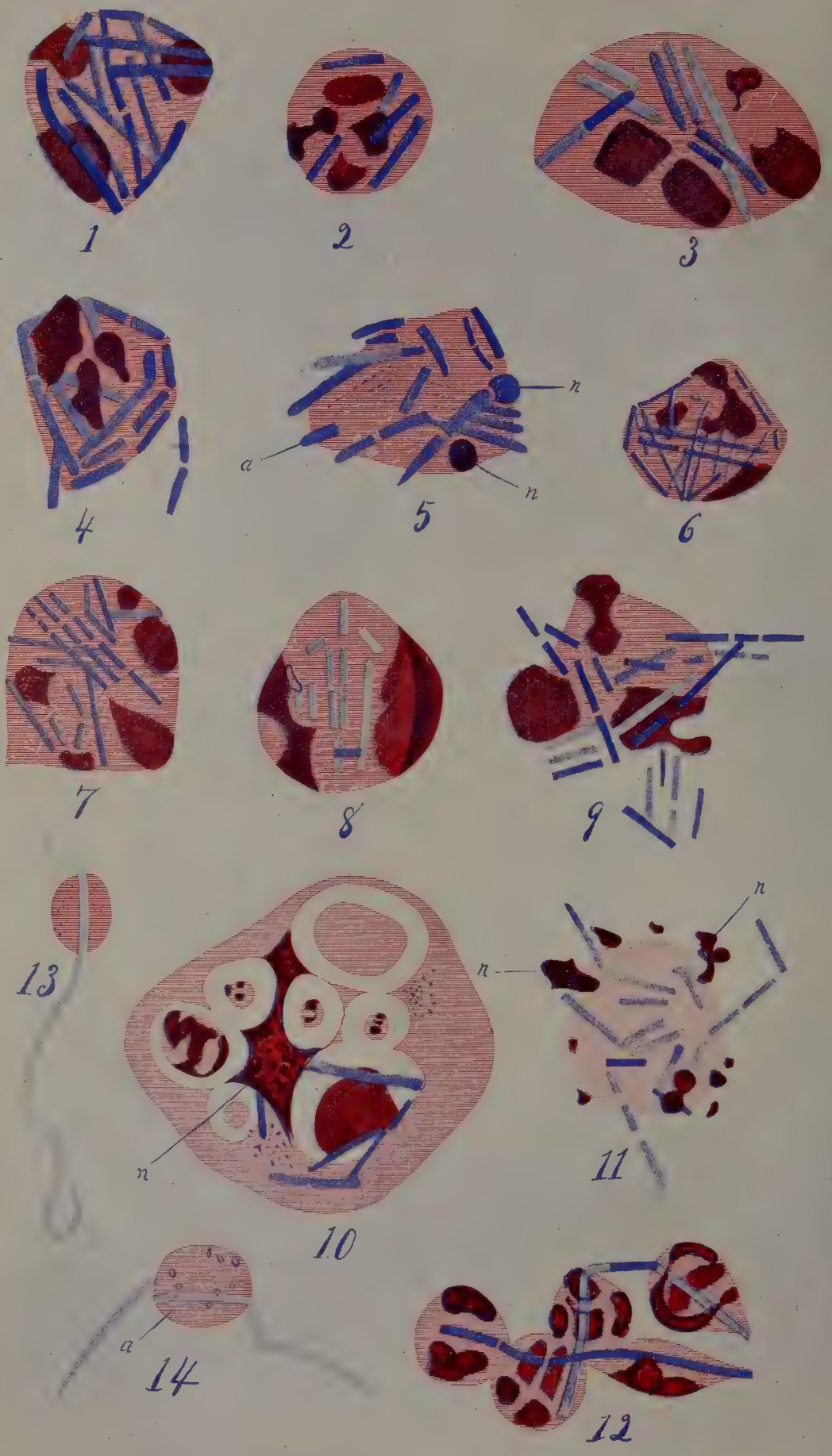


PLATE I.

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THE

BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., NOVEMBER, 1891. NO. 1.

ORIGINAL ARTICLES.

INFLUENCE OF THE CONTINUOUS CURRENT ON MICROBES, PARTICULARLY ON CHARBON BACTERIDIA.

BY M. N. APOSTOLI AND LAGUERRIERE, OF PARIS.

APRIL 28, 1890, we presented to the Academy of Sciences in Paris, a note giving a very brief account of the work that we had undertaken together, since 1888, to ascertain the influence of the continuous current on microbes.

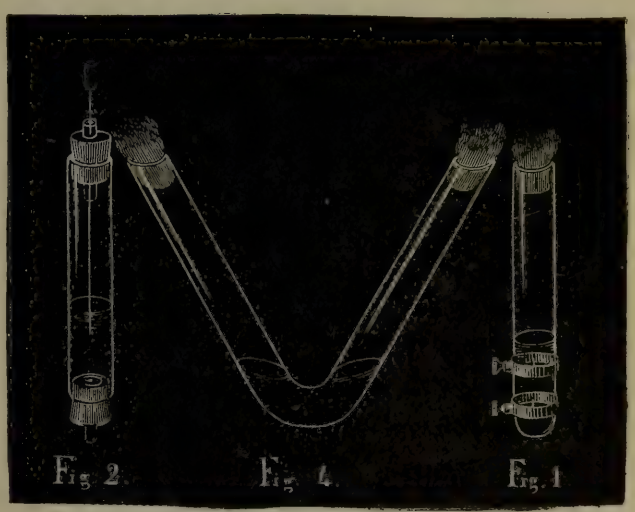
The Society of Electrotherapy being now organized, we would submit, with additional details, this same work to its appreciation.

Others before us have made experiments to determine the influence of electricity on microbes.

The first of these was Schiel, who, in 1875, endeavored to ascertain the effect of the continuous current, and of the induced current on bacteria of infusions of hay and meat. His conclusion was that feeble currents sufficed to modify microbian vegetation.

In 1879, Cohn and Mendelssohn examined this question. Their experiments were made principally on the culture of the *micrococcus prodigiosus* on potatoes; that is to say, on a solid substance. The general conclusion reached was that the fields of culture, and the microbes that they contained, were modified by the electrolitical effects produced by the current. As for ourselves, we have desired to enlarge the circle of preceding experiments, and to determine, as far as possible, their significance; and the following are the results of our new and personal researches.

We have employed different media of solid and liquid culture; but, generally speaking, we have used peptonized broth. Our study has been on many microbes, some of which were pathogenic, others non-pathogenic. First of all, we have used the bacteridia of charbon, that organism being the one best adapted to the experiments of the laboratory.



In our researches, we have first utilized a strong experimenting tube, traversed horizontally by two platinum wires, placed about three centimeters from each other, and soldered to a metallic armature destined to establish a connection. See Fig. 1.

In the next place, we have utilized cylindrical tubes of the same caliber, whose two extremities were closed by India-rubber stopples; the lower stopple was traversed by a platinum wire, twisted in a spiral in the interior of the tube; the upper stopple was traversed by a small glass tube closed by a cotton-batting plug

permitting sterilization, and being itself traversed by a platinum wire extending more or less on the media experimented upon. See Fig. 2.

This plan was more convenient than the first, but it did not, however, permit us to study separately the differential action of the poles, and we were obliged to resort to a veritable apparatus composed of four communicating tubes, and whose cultures have often been intercalary stoppers of gelosine. See Fig. 3.

At the present time we also utilize tubes in V (see Fig. 4), whose disposition is very convenient for cultures on old media (gelatine, gelose, potatoes).

In all our experiments, the tubes or apparatus were sterilized, first, through the boiling process; then they received


Fig 3.

the media of culture next sown; or, more generally, the contents of several tubes of liquid cultures (peptonized broth) were thoroughly mixed in a sterilized bottle, then distributed in experimenting tubes.

Tubes of cultures were preserved as witnesses and as means of control.

The removals of cultures were always made purely by means of tubes, before and after the passage of the current, and these removals themselves served to make new cultures or test inoculations.

Our experiments of control have been made on numerous animals, and have killed 140 guinea-pigs, forty-two rabbits, and two dogs. In these experiments, some animals under test were inoculated before the passage of the current; others, in their turn, underwent the same operation after the passage of the current, and with removals made on the positive and negative tubes, and on each of the interpolary tubes.

Our inoculations were made with the syringe of Prof. Strauss, first at the Practical School, then at the laboratory of Prof. Pouchet, in the Museum.

While acknowledging the labors of Schiel and those of Cohn and Beno Mendelssohn, we think we have taken a large contributive part in the study of the important question of the influence of the current on the vitality of microbes.

1. We have experimented with the principal fields of culture utilized in laboratories.

2. We have used pathogenic microbes and non-pathogenic microbes. With the latter, we have made numerous inoculations in animals, which have enabled us to determine to what extent microbes were attenuated in their virulence, or even destroyed.

3. With our apparatus with communicating tubes whose contents were separated by partitions of a conductor (gelosine), we have clearly determined and differentiated the action of the current on each pole and on the interpolary circuit, and we have shown: —

(1.) *That this action was en rapport with the intensity of the current;* and,—

(2.) *That it was manifested only at the positive pole, not being at all apparent at the negative pole and in the interpolary circuit.*

4. In determining the influence of the intensity, we have shown that the intensity is the principal factor of the attenuation or of the destruction of the virulence, and that the duration of the application of the current is but a secondary factor.

5. We have employed the highest medical doses utilized in electrotherapy.

6. We have eliminated the thermal influence due to electrolysation, to better appreciate the pure and simple electric action.

7. Finally we have equally demonstrated that, outside of the thermal action, the electrolytic products accumulated at the positive pole, are the only

agents of the attenuation or destruction of microbes.

As to the researches of Prochownich (of Hamburg), they were instituted after ours, and we have been glad to see that he confirmed our personal conclusions with great authority.

With these general considerations thus expressed, we will present, chronologically, the very brief and synthetical summary of the different series of our experiments, which will serve as a basis of future complemental researches.

First Series (October 23, 1888), Bacteridix of Charbon.— Tubes No. 1.

A current of 150 milliamperes, applied 3 minutes, one hour after supplying the tubes with peptonized gelatine, hindered all vegetation in those tubes, at the same time that it was being developed in the witness-tubes.

Guinea-pig with witness-tube, died.

Guinea-pig inoculated with experimenting tube, survived.

Second Series (November 9, 1888), Charbon.[1] *Tubes No. 1.*

1. Current of 150 milliamperes, on an average, applied 3 minutes on tubes of peptonized gelatine in full bacteridian vegetation since seven days, hindered the march of vegetation, without destroying it.

2. A current of 200 milliamperes, applied on tubes of gelatine in full bacteridian vegetation during 3 minutes, destroyed all vegetation and all virulence.

Cultures and inoculation made with witness-tubes have proved a success; the cultures and inoculations made with experimenting tubes remained negative.

The third, fourth, and fifth series of experiments have not furnished results that were appreciable or sufficiently interesting to be chronicled.

Sixth Series (March 7, 1889), Bacilus Anthracis[2] *and Others.—Tubes No. 1.*

1. A current of 80 milliamperes, 3 minutes, 2 minutes, or 1 minute only, on tubes of gelatine, did not modify the virulence.

2. Three guinea-pigs inoculated with the product of each of the tubes, died the third day after the inoculation.

Seventh Series (March 20, 1889), Micrococcus Prodigiosus, déeper blue Sarcina, Anthrax.— Tubes No. 1.

1. A current of 100 milliamperes, applied 3 minutes, did not modify the tubes of the *micrococcus prodigiosus.* The sowing done with experimenting tubes succeeded like those that were accomplished with witness-tubes.

2. A current of 140 milliamperes, applied 3 minutes, did not produce an appreciable action on the bluest tube sown on gelatine. The tubes sown with an experimenting tube gave the same result that those did which were sown before the operation.

3. A current of 160 milliamperes, applied 3 minutes, appears to have modified vegetation of yellow sarcina.

4. A current of 168 milliamperes, 3 minutes, did not modify the virulence of the charbon culture broth. Two guinea-pigs inoculated after the passage of the current, died in forty-eight hours, as did the witness guinea-pig inoculated before the operation.

Eighth Series (April 6, 1889), Micrococcus Prodigiosus, Bacillus Subtilis.— Tubes No. 1.

1. A current of from 80 to 100 milliamperes, applied 3 minutes, did not modify the vegetation of the *micrococcus prodigiosus.*

2. The same intensity of current, applied 5 minutes, did not modify the vegetation of *bacillus subtilis.* In these two cases, the sowing done before and after the experiment, gave the same positive results with peptonized broth.

Ninth Series (April 24, 1889), Charbon. Tubes No. 2.

1. Tubes with gelatine containing anthrax cultures whose vegetation had been destroyed the 31st of March, by the current, are successfully sown with microbes of putrefaction.

[1] In all our experiments with pathogenic forms, we have operated exclusively with bacteria of charbon.

[2] Bacteridia, or bacillus, of anthrax and charbon are identical.—Ed.

2. Tubes of peptonized gelatine, not sown, having, two months before, been subjected to the influence of a current of 200 milliamperes, were successfully sown with microbes of putrefaction.

Tenth Series (April 26, 1889), Charbon. Tubes No. 2.

A current of 40 milliamperes, 3 minutes, did not modify the virulence. Some result with a current of 60 milliamperes. Guinea-pigs inoculated, succumbed.

Eleventh Series (May 31, 1889), Charbon. Tubes No. 2.

1. A current of 100 milliamperes, 3 minutes, on tubes of charbon whose virulence was naturally attenuated by age, did not produce appreciable results; of two guinea-pigs inoculated before the experiment, one died in the night of June 3 to 4.

2. A current of 250 milliamperes, applied 3 minutes on peptonized gelatine, from the 20th of May, modified the virulence; a guinea-pig inoculated before the experiment, died; another inoculated after the passage of the current, survived.

Twelfth Series (June 4, 1889), Charbon. Tubes No. 2.

A current of 160 milliamperes, applied 3 minutes, appeared to have attenuated the virulence. A guinea-pig inoculated after the experiment, succumbed in forty-eight hours; of two guinea-pigs inoculated after the experiment, one died in the night of June 8 to 9.

Thirteenth Series (June 9, 1889), Charbon. Tubes No. 2.

A current of 170 milliamperes, applied 9 minutes on broth of fresh culture, produced no appreciable effect; two guinea-pigs inoculated before the operation, died in the night of June 10 to 11. Of three guinea-pigs inoculated after the experiment, two died also in the night of June 10 to 11, and the third in the night of June 11 to 12.[1]

[1] The different answer obtained in the experiments of the 12th and 13th series, which appears to be contradictory, is, without doubt, owing to a difference in the degree of the virulence of the anthrax employed.

(To be continued.)

THE INFLUENCE OF DRESS IN PRODUCING THE PHYSICAL DECADENCE OF AMERICAN WOMEN.

J. H. KELLOGG, M. D., BATTLE CREEK.

["Annual Address upon Obstetrics and Gynecology," delivered before the Michigan State Medical Society at the Annual Meeting held at Saginaw, June 11 and 12, 1891. Illustrated by a stereoptican.]

As my subject suggests, I am to undertake to show that certain features of the mode of dress common among civilized American women have been, and are, a prominent factor in producing a widespread and marked physical deterioration among the women of this country. Possibly the question may be asked whether such a deterioration exists. It is not probable, however, that it will be worth while to spend any considerable time in attempting to demonstrate the proposition that American women are degenerating physically, before an audience made up chiefly of medical men and women; for has there been a medical convention dinner within the last quarter of a century at which there was not heard the familiar toast, "Woman — God's best gift to man, and the chief support of the doctors"?

A few months ago, I addressed an audience of six or seven hundred young women at an educational center in a neighboring State, upon the subject of physical culture. As my audience seemed to be an amiable one, I ventured to ask a few questions, and among other inquiries, asked how many women present (all of whom had reached adult age) believed themselves to be physically superior to their mothers. A bare half dozen raised their hands, and two or three of them timidly looked about, apparently to see if any one present was prepared to contest their claim.

One of the most convincing evidences of the physical failure of American women is to be found in the fact developed by the last census of the United States, that there has been, in the last ten years, an enormous falling off in the birth-rate, as the result of which several million babies

are lacking. A lowered birth-rate is a much more serious matter than an increased death-rate, although the immediate result as regards the population might be the same. An increased death-rate may mean nothing more than a temporary increase in the activity of one or more of the causes of disease and death, while a lowered birth-rate means a radical and constitutional fault of some sort, threatening the very existence of the race. Any one who has had an opportunity to become acquainted with the physical condition of the average young woman of the present generation, will be easily convinced that the next census will show a still greater falling off in the birth-rate than the last. A corset-choked woman knows very well that she is quite unfit, physically, for the rearing of children; and besides the physical unfitness, she finds herself so lacking in fortitude, and so oppressed with nerves and neuralgias and an abnormal susceptibility to pain, that she very naturally shrinks from the physical ordeal, as well as the mental and moral responsibility, which motherhood involves.

Another most significant fact, for which mothers must be held largely responsible, is the enormous business carried on at the present time in the manufacture and sale of infant foods. According to a paper read by Dr. Hoffman, before the American Association for the Advancement of Science, at its last meeting, there is consumed in the United States every year, not less than eight or ten million dollars' worth of infant foods. That these foods are rarely, if ever, perfect substitutes for the child's natural aliment, is well known. What has created such an enormous demand for these substitutes? Certainly it is not the unnatural increase of the number of infants which has exhausted the natural food supply; for I have already mentioned that there has been, in the last ten years, a falling off in the birth-rate amounting to several millions.

These evidences point with tremendous emphasis to the fact of the decline of stamina in American women. A host of other facts confirming and supporting those given, might be brought forward; but I will not thus unnecessarily consume your time, since the proposition is not likely to be disputed by any intelligent physician who has had wide opportunities for observation.

But I must not devote more of the half-hour allotted me, to introductory remarks. Fully realizing that I am likely to incur the displeasure of some of my fair auditors before I have done with my subject, I may as well declare myself at once as prepared to defend the proposition that the average civilized American woman is deformed. This very uncomplimentary proposition doubtless impresses my hearers as somewhat startling. Nevertheless, I believe the evidence which I shall present will convince the majority of you that, however repulsive and distressing the fact may be, it is true.

A penchant for modifying the natural form of the body so as to produce deformity in some part, seems to prevail quite extensively in the human race, although it must be admitted that in many savage, and some civilized tribes, this strange propensity takes a less dangerous direction than among the civilized races. The Indian woman of Alaska ornaments her upper lip with a pin stuck through it. Among the women of some other savage tribes, fashion demands that a fish-bone or a piece of wood be inserted in the under lip in a similar fashion, by means of which the flesh is dragged down, and a strange deformity produced. The civilized woman finds the lobe of her ear a more convenient place from which to hang her jewelry, and so she bores a hole through this part of her body, and inserts a wire weighted with a stone, and thus emulates the example of her savage sisters. There are mothers roaming in the forest, shoeless, hatless, and without other garments than a bark apron and the picturesque designs of the tattooer's pencil, whose solicitude for their children leads them to compress their heads into cones, or to

shape them to a fascinating flatness by the steady pressure of a board against the infant skull. Other mothers, less barbarous, but none the less anxious for the welfare of their little ones, squeeze the feet of their daughters into shapeless masses of bones and gristle, in the firm belief that no young lady can make an eligible bride if her foot exceeds in measure the conventional three inches. Still other mothers, more civilized, and none the less fondly thoughtful of their daughters' interests, base their expectations of a successful career for them as much upon the meager dimensions of their waists as upon the comeliness of their countenances or the brilliancy of their accomplishments.

Some years ago, while engaged in some anthropometric studies among Chinese women and the women of the primitive Indian tribes of Arizona and New Mexico, I was forcibly struck with the marked difference in physical proportion between the savage and the civilized woman. I have made personally, and secured through others, a large number of measurements, which place upon a mathematical basis certain points of difference that are exceedingly pronounced, particularly the larger waist of the savage or semi-civilized woman when compared with the highly civilized woman. I have since extended my studies of the subject to the peasant women of various nationalities, particularly French, German, and Italian women, and a single race of East Indian women. Early in the course of my studies, the thought occurred to me that there might be a positive and constant relation between the external configuration of the body and the malposition of various internal organs. I accordingly devised a simple apparatus for the purpose of making outline traces of the figure at any desired angle. With this instrument I have made a large number of tracings (several hundred in all), and have made a careful study of the position of the abdominal and pelvic viscera in each case.

The following is a tabulated statement of some facts which I have collected, and which bear especially upon the matter of waist proportion: —

	Av. height (ins.)	Av. waist (ins.)	Per cent of waist to height.
American women	61.64	24.44	39.6
Telugu women of India	60.49	24.65	40.6
English women (brick-makers who wear heavy skirts)	60.04	25.00	41.3
French women	61.06	28.00	45.4
Chinese women	57.85	26.27	45.4
Yuma women	66.56	36.84	55.2
Civilized men — American	67.96	29.46	43.3
Mrs. Langtry	67.00	26.00	38.8
Venus de Milo			47.6
	Height	Waist.	Percent. of waist to height.
Average of 43 women, from 18 to 25 years old	60.7	27.1	44.64
Average of 25 women, from 18 to 30 years old wearing corsets or tight bands	62.5	23.3	37.3
Average of the same 25 women a few months after reforming their mode of dress	62.5	27.15	43.4
Average of 10 girls, from 9 to 12 years old		23.5	
Average of 2,000 men, from 18 to 27 years, measured by Dr. Seaver, of Yale	68.6	29.3	42.7

A few remarks upon the above figures will render them more significant. Of the 100 American women whose average proportions are given in the table, the majority were upwards of 30 years of age.

Dr. M. Anna Wood, of Wellesley College, has measured 1,100 women between the ages of 19 and 21 years. Her measurements make the height of the average American woman to be 63 inches, waist 24.6 inches; percentage of waist to height 39.

The Telugu women of India, as I am informed by Miss Cummings, who kindly made a large number of measurements for me, sustain the skirt, which forms almost their only clothing, by means of a cord tied around the waist and drawn as tightly as possible. This is doubtless the reason for the small waists of these women as compared with those of the women of other savage or semi-civilized tribes.

English working women doubtless often do themselves great harm by wearing many heavy skirts attached to waistbands. I once found a young English woman engaged in the very laborious occupation of making brick, kneading the clay with her fist as a baker kneads dough, and beating it into the moulds with her fist, who was at the same time carrying

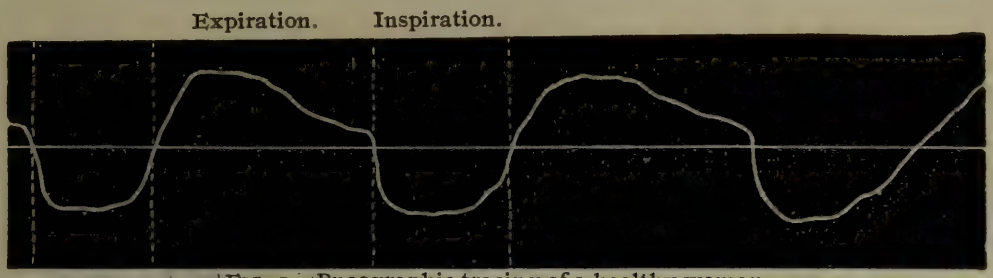


FIG. 1. Pneographic tracing of a healthy woman.

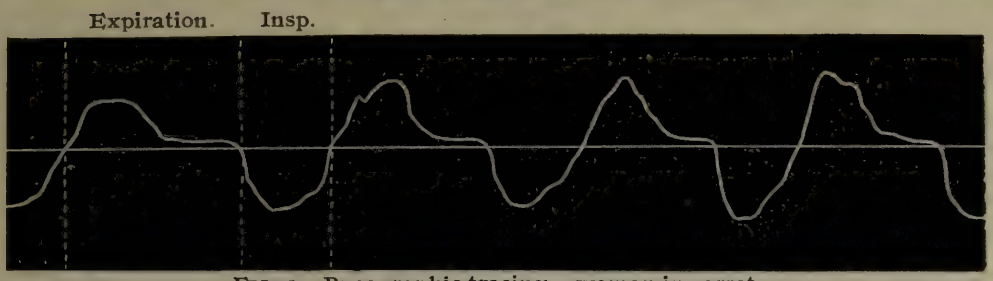


FIG. 2. Pneographic tracing—woman in corset.

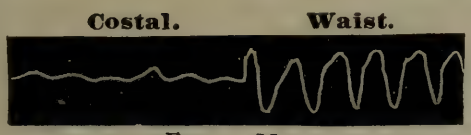


FIG. 3. Man.

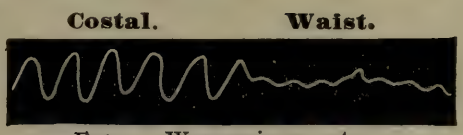


FIG. 4. Woman in corset.

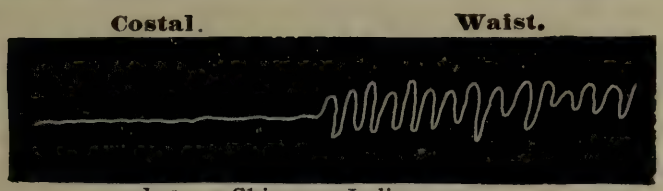


FIG. 5. Chippewa Indian woman.

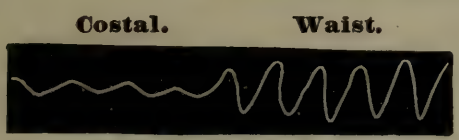


FIG. 6. Woman who never wore a corset.

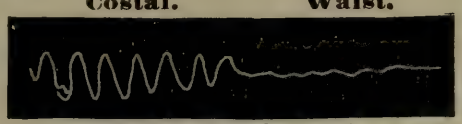


FIG. 7. Man in corset.

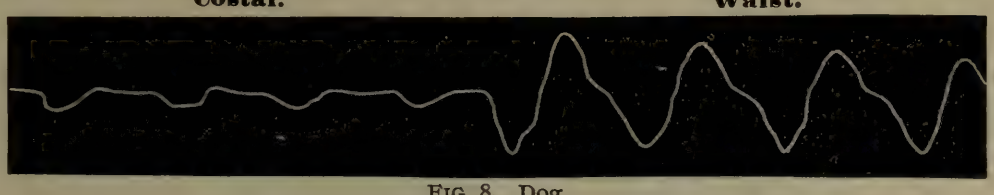


FIG. 8. Dog.

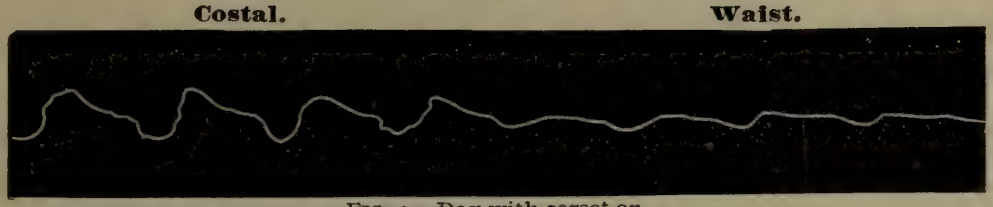


FIG. 9. Dog with corset on.

PLATE I.—BREATHING MOVEMENTS IN MAN AND DOG.

upon her waist the weight of six heavy quilted skirts, with no other support than bands. The average waist measure of a dozen English women brick-makers was 25 inches, and the proportion to height 43.7 per cent.

The German peasant woman, unless she has the misfortune to live sufficiently near some large city to be somewhat influenced by the example of her fashionable sisters, discards waistbands altogether and wears her garments suspended from the shoulders by means of a waist, which gives her a more vigorous figure than the English peasant woman.

French women are in the last-named respect also more fortunate than their English sisters, by reason of which they enjoy the advantage of a waist proportion of 45.4 per cent of the height.

Chinese women, of whom I have made a large number of measurements, and received much more data through the kindness of Miss Culbertson, of the Home for Chinese Women, San Francisco, and also from a lady medical missionary in China, although considerably below the average height of American women, have two inches greater waist circumference, which is doubtless attributable to the fact that their mode of dress is such as to allow the most perfect freedom of movement and room for development at the middle portion of the trunk.

But the primitive Yuma Indian women of Arizona and New Mexico excel all others whose waist measures I have taken, the average waist proportion being 55.2 of the height.

The famous English beauty, Mrs. Langtry, has recently had published a detailed account of her physical proportions, by which it appears that her height is 67 inches, and her waist measure only 26 inches. Mrs. Langtry takes evident pride in the fact that many of her measurements correspond very closely with those of some ancient Grecian models, but she omitted to call attention to the fact that her waist measure is only 38.8 per cent of her height, while that of the queen of all the ancient statues of women which have been discovered, the famous Venus de Milo, is 47.6 per cent of the height. Mrs. Langtry's waist measure, to be in the same proportion as that of the Greek beauty, should be 32 inches. I have taken the pains to make measurements of a considerable number of male statues, the work of eminent ancient artists, preserved in various European galleries, and find the average proportion of the waist to height of seven famous models to be 46.4, or a little less than that of the Venus de Milo.

I have recently made measurements of 43 working women between the ages of 18 and 25 years. These young women were all wearing loose garments, having been induced to do so by a representation of the evils resulting from waist constriction. Some had but recently adopted a healthful style of clothing, while others had enjoyed the advantage of ample waist room for several months or years. In a few instances, corsets and tight waistbands had never been worn. I found the average waist measure of 43 young women, who were selected only with reference to age, to be 27.15 inches, or 44.64 per cent of the height, nearly 3 inches in excess of the average feminine American waist. The waist of a young woman with this proportion, and of the same height as Mrs. Langtry, would measure 30 inches instead of 26.

Comparative measures made in the cases of 25 of these young women showed that before the adoption of loose garments their average waist measure was 23.3 inches. Since that time there had been an increase in waist proportion to such an extent that the average waist measure at the time the measurements were taken was 27.15 inches. The proportion of waist to height in these 25 young women had increased by the change of dress from 37.3 per cent to 43.4 per cent, and the waist measure had gained 3.85 inches, or 6.16 per cent.

I recently secured the measurements of 10 girls between the ages of 9 and 12

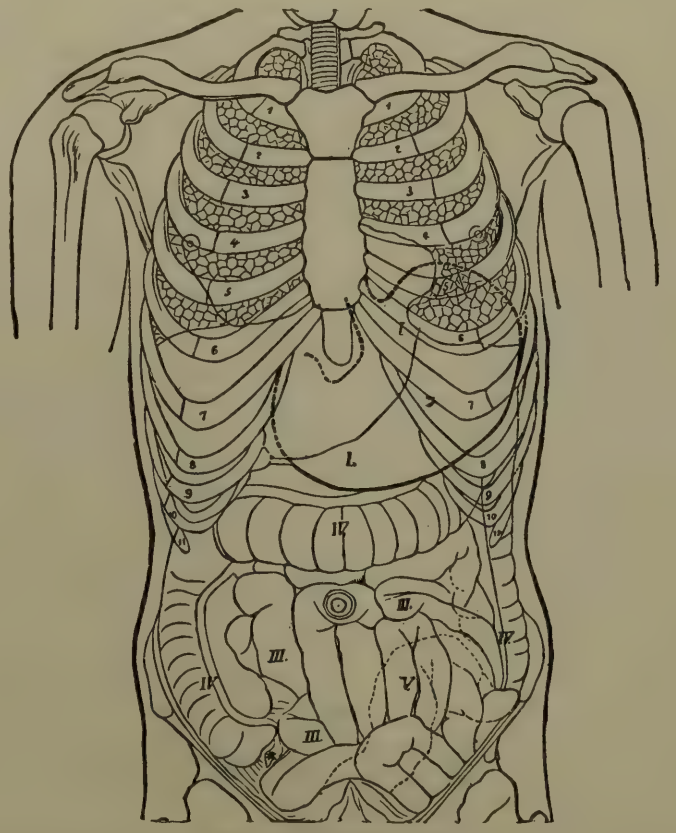


FIG. 1. (After Ziemssen.)

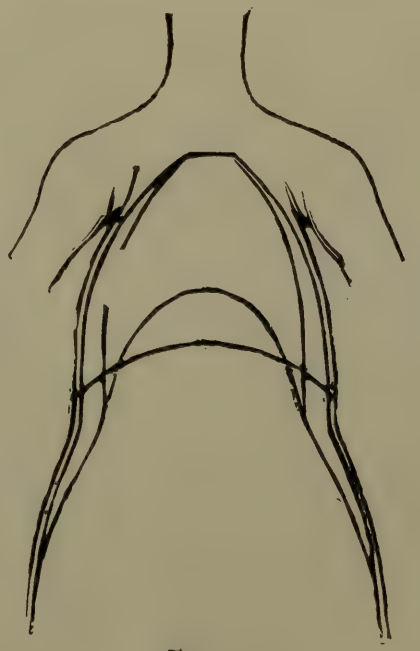


FIG. 2.

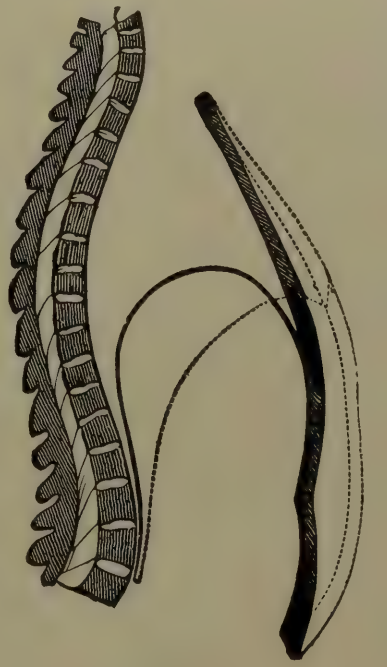


FIG. 3.

PLATE II.

years, and found the average waist measure to be 23.5 inches.

From these facts is it not evident that the small waist of the civilized American woman is a deformity? Can any one assign a physiological reason why the civilized woman should have a smaller waist than the savage woman; or why Mrs. Langtry's waist measure should be 26 inches instead of 32? Certainly no other reason can be given for the abnormal waist of the civilized woman than the fact that this portion of the body has been subjected to abnormal pressure in such a way as to prevent natural development and to compel the acquirement of a deformity.

If, in answer to the question why the civilized woman of to-day has a smaller waist than the beautiful women of ancient Greece, whose figures furnished models for the sculptors whose masterpieces modern artists have sought in vain to equal, it is said that the change observable is a product of evolution, or a result of civilization, may we not pertinently inquire why a similar change is not to be found in the modern man?

Two other pertinent questions may be asked in this relation: —

1. Why does the civilized woman require a smaller waist than the civilized man? Certainly no physiological reason can be given, and well-known anatomical facts suggest that if there is any natural difference in proportion, woman requires a larger waist than man. She has a larger liver in proportion to her size and weight than man, and the exigencies of motherhood require provision for an increase in waist capacity to which man is not subject. It is interesting to note, also, in this connection, that the waist proportion of the Venus de Milo, who may be considered as the typical woman of the ancient Greeks, is 47.7 per cent, while that of the average Grecian man, already shown, is 46.4.

We can draw but one conclusion from these considerations, namely, that the small waists of the women of modern times are an abnormality. My tables also show the average modern feminine waist, when it is allowed a chance for natural development, to be nearly two per cent larger in proportion to the height than the modern male waist.

2. A second question to which I invite attention is, Why does the waist of the civilized woman cease to grow at the age of 10 or 12 years, while the rest of the body continues to develop? Lungs, liver, stomach, spleen, bowels, pancreas — all the organs which occupy the region of the waist line, continue to grow, but the waist of the civilized woman absolutely refuses to increase in size, notwithstanding the developing force beneath it, after the age of 12 or 14 years. I find the average waist measure of girls from 9 to 12 years of age to be 23.5 inches. I have in some instances found the waist measure in girls of 12 to be 26 inches. The rational answer to this question is the fact that about this age the constricting influence of tight bands, corset waists, or corsets begins. The fashionable dressmaker insists that the young lady's figure must be "*formed*," and so, as she develops, she grows into a mold like a cucumber in a bottle. And thus it happens that we find the civilized woman with a waist disproportionately small, as we find, among the aristocratic class of Chinese women, dwarfed and misshapen feet. The small-footed woman of China, in consequence of her deformity, is compelled to hobble about in a most ungraceful fashion, requiring usually one or more persons to sustain her in keeping her balance. She cannot run, skip, or dance as can her large-footed sisters. She is willing, however, to endure the inconveniences of being a cripple and the loss of the use of her feet and legs rather than forego the pleasure of being in fashion. If the sacrifices which the civilized woman makes to fashion were no greater, there would be comparatively small ground for complaint, but the constant girding of the waist results in mischiefs of vastly greater magnitude than those which the Chinese woman inflicts upon herself.

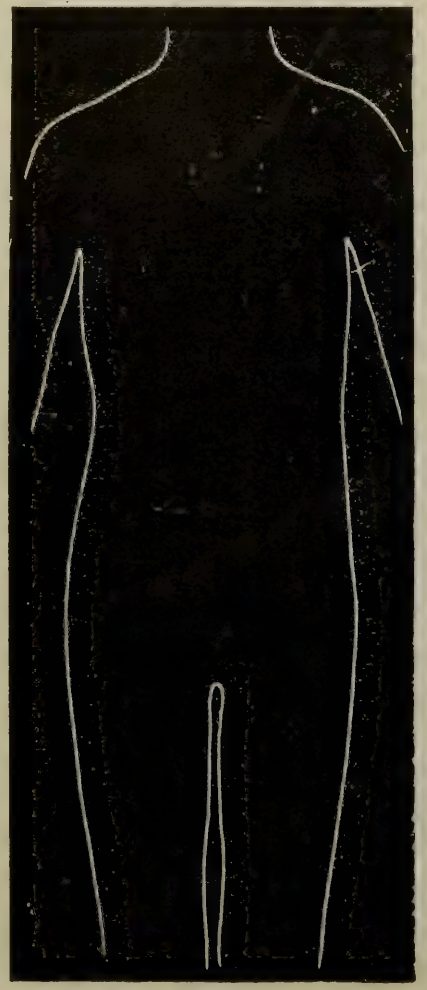


FIG. 1. Man.

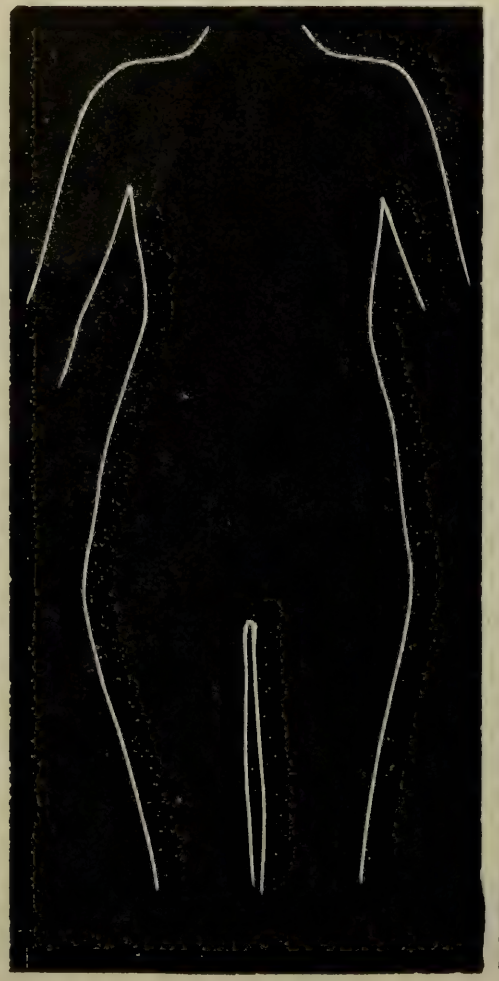


FIG. 2. Woman.



FIG. 3. Greek Statue.



FIG. 4. Italian model girl.

PLATE III. NATURAL FIGURES.

As the flat-headed woman watches with interest and growing pride the progressive depression of her infant's skull, while from day to day she binds more tightly upon it the flattened disc of wood; and as the Chinese woman glories in the shriveled and misshaped stump of what was once her child's foot, as a developing mark of aristocratic gentility, in like manner does the civilized mother pride herself on the smallness and roundness of her daughter's corset-deformed waist, disregarding alike the suggestions of art, the warnings of science, and the admonitions which nature gives in the discomfort and distress occasioned by the effort to secure a change in the natural contour of the human form which is more monstrous in its violation of the laws of beauty, more widely at variance with the dictates of reason, and more disastrous in its consequences to bodily health and vigor, than any similar barbarity practiced upon themselves or their children by the members of any savage or semi-savage tribe. How such a disfigurement of the physique could ever have come to be considered desirable or beautiful, is a problem hard to solve, since it involves not only an enormous loss of strength and vigor, but a violation of all the relevant precepts and principles of art which have been handed down to us by the great masters, as well as rules of hygiene in which all medical men of every age agree.

I may ask further, How does it happen that the waist of the average girl of 9 or 12 years measures 23.5 inches, while the waist of the young woman of from 18 to 30 years who has worn corsets or tight bands for a number of years, is only 23.3 inches? Why should the waist *decrease* in size with age while every other bodily dimension *increases?*

Still another question of interest arises from the fact to which almost every woman can testify, that the waist of the average woman accustomed to constriction from clothing, increases in measure whenever it has an opportunity for development, as when the common mode of dress is exchanged for a more healthful one, or ordinary clothing laid aside for a few weeks, as during confinement to bed from illness. Probably few women will question the fact that the waist is made smaller by constriction of the corset and tight bands. A lady said to one of my nurses, when she learned of her healthful mode of dress: "But how do you manage to keep your stomach down?" The corset is worn with a deliberate purpose of modifying the form of the waist, which it does, to the great damage of health and vigor. I have shown by careful measurements in some hundreds of cases, that the waist of an adult woman increases within a few months, under the influence of proper clothing and proper exercise, from one or two to six or seven inches.

Let me call your attention more directly to some of the important particulars in which the ordinary mode of dress among civilized women, especially constriction of the waist, results in physical injury. The chief of these are: —

1. Downward displacement of all the abdominal and pelvic organs, and numerous functional and organic diseases growing out of this disturbance of the static relation of these organs.

2. Lack of development of the muscles of the trunk, which by long compression and disuse, to a very large degree lose their functional activity, resulting in relaxation of the abdominal walls, weakness of the muscles of the back, general physical feebleness, and destruction of the natural curves of the body, which are not only necessary for health, but also essential to physical grace and beauty, and the development of many bodily deformities, such as drooping shoulders, flat or hollow chest, sunken epigastrium, straight spine.

3. An ungraceful and unnatural carriage of the body in sitting, standing, and walking.

4. An abnormal mode of respiration.

The idea that a displaced stomach can be a possible cause of disease or inconvenience may be new to some. Nevertheless, the researches of Glenard, Bouchard,

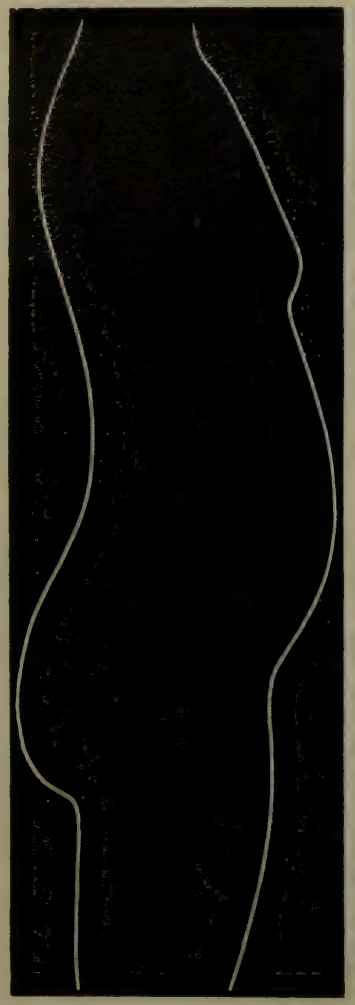


FIG. 1. Reformed corset wearer.

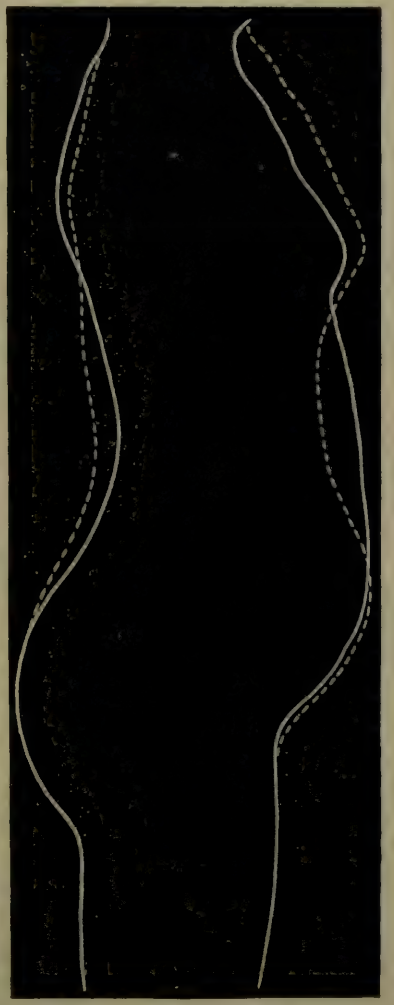


FIG. 2. The same with corset.

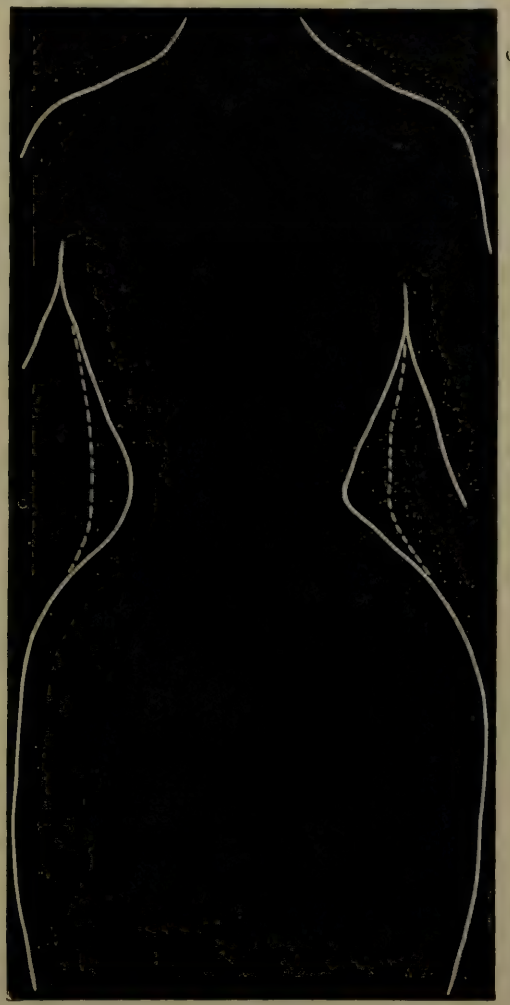


FIG. 3. Young woman whose "clothes were never tight."



FIG. 4. Side view of the same.

PLATE IV.

Dujardin-Beaumetz, and other eminent French physicians, have shown beyond room for doubt that displacement of the stomach, bowels, kidneys, liver, and other abdominal viscera, may be productive of the most pronounced disturbance of health and a source of great inconvenience. Indeed, from my own studies on this subject I have become convinced that a displaced and dilated stomach is more likely to be productive of immediate and harmful consequences of a grave character, than displacement of the pelvic viscera. But before one can fully understand the relation of waist constriction to displacement of the abdominal viscera, it will be necessary to call to mind a few important anatomical facts.

The trunk is practically divided into two cavities. The division of the lower cavity into pelvis and abdomen is an artificial and not an anatomical subdivision, useful for the purpose of discription, but misleading and confusing, unless ignored in studies concerning causation and pathological relations. Anatomically, the trunk is divided by the diaphragm into two cavities only, the upper containing the chief organs of respiration and circulation, and the lower containing the principal organs of digestion and the genito-urinary apparatus. The chief anatomical facts which I desire to be kept in mind are, the normal position of each of the viscera which occupy the lower cavity of the trunk, and the mode in which these various organs are held in place. It will be remembered that the liver, spleen, pancreas, and stomach are all located above or at the waist, as shown in the accompanying diagram after Ziemssen. Plate II. The transverse colon lies at the waist line, the point of junction of the ascending and transverse colon on the right side dropping a little below the line, while the point of conjunction of the transverse with the ascending colon at the left side rises considerably above the waist line, being held in place by the pleuro-colic fold of the meso-colon. The kidneys lie just at the waist. The greater portion of the space below the waist is occupied by the small intestines, the bladder, and the rectum, with the uterus and its appendages in the female, and the prostate gland and other special structures in the male. It is noticeable that the organs of the greatest weight and functional importance are located at or above the waist.

How are all these important organs held in position? Although fitted together with the nicety of an articulation, the viscera are certainly not held together by anything corresponding to the firm ligamentous bands which unite the osseous elements of a joint. Every abdominal surgeon will testify to the extreme propensity for escaping from the abdominal cavity when the slightest opportunity offers, manifested by some of the viscera. The so-called ligaments which hold in place the liver, stomach, spleen, and bowels, cannot properly be called ligaments, as very little ligamentous structure enters into their composition. The same must be said of the ligaments which are supposed to support in place the uterus and ovaries, although it must be added that some of the uterine ligaments contain muscular tissues which play a very important part in maintaining the uterus in its proper relation to the trunk and the contiguous organs. I think the idea is gaining ground among those who have made a special study of this subject, that the chief factors in the support of the pelvic viscera, as well as other of the organs of the lower trunk cavity, are the tone of the muscular walls of the abdomen and the juxtaposition of the organs themselves.

Compression of the waist necessarily involves displacement of the organs occupying this portion of the trunk. The unyielding character of the chest walls, and the resistance of the diaphragm prevent any considerable displacement in an upward direction. Consequently, the necessary result of waist-compression, either by the corset or by tight bands, is, that the liver, stomach, bowels, and other organs occupying this zone of the body, are car-

ried downward. The same force which diminishes the circumference of the body at the waist, interferes with the normal activity and development of the muscles which form the anterior wall of the lower trunk, so that they offer little resistance to the displacing force applied at the waist.

In nearly twenty years of medical practice, I have had to deal almost exclusively with chronic disorders of various sorts, and especially with two classes of chronic disease,— digestive disorders, and maladies peculiar to women. Having under observation from 1,000 to 1,500 cases annually, under conditions favorable for careful study and comparison, I long ago noticed the remarkable frequency of the association of certain forms of pelvic disorder, especially in women with a narrow waist and a protruding abdomen. I did not, however, attach so great importance to the matter as I should have done, I frankly confess, had I not had an erroneous notion respecting the normal contour of the female figure. It was only after careful study of this matter among savage women, and women whose figure had never been modified by the deforming influence of the ordinary civilized dress, that I acquired a basis from which to view this subject in a rational way. I then began careful inquiry into the matter, and for several years back have made, in all cases of pelvic diseases of women coming under my observation, a careful study of the condition and relative position of the various abdominal viscera, as well as of the pelvic organs.

In 250 cases of women suffering from pelvic diseases, taken consecutively and without selection, in each of which a careful examination was made with reference to the condition and position of each of the abdominal viscera as well as of the pelvic organs, I observed the following disturbances of the static relations of the viscera :—

In 232 cases, downward displacement of stomach and bowels.

In 71 cases, right kidney distinctly movable and sensitive to pressure.

In 6 cases, both kidneys freely movable.

In 2 cases, downward displacement of the spleen.

In one of these cases, the spleen lay at the bottom of the abdominal cavity. I have found a large number of outline tracings in cases of women suffering from pelvic diseases, and supplemented these by careful examination of the position and conditions of the abdominal and pelvic viscera, with the following results, as regards the relation of the static changes in the abdominal organs, to similar changes in the organs of the pelvis.

In 150 cases of pelvic disease, the stomach and bowels were displaced in 138 cases.

In 66 cases the stomach and bowels were displaced without displacement of the uterus. In 26 of these cases, there was also a displacement of one kidney, and in five, a displacement of the liver.

In only seven cases was there displacement of the uterus without displacement of the abdominal viscera, and three of these were cases of large uterine fibroids in which the visceral displacement was probably present, but masked by the morbid growth.

I shall have thrown upon the screen, presently, outline tracings of the figures of some of these cases, which will show very clearly the amount of visceral displacement occasioned by an improper dress. My statistics seem to show very clearly that visceral displacement is not a disease which is especially confined to the pelvis. Indeed, a careful study of the means by which the pelvic organs are held in place, suggests that they are better provided for in this respect than any other of the viscera below the diaphragm. The data which I have collected respecting the relative frequency in the displacement of the pelvic organs, and other organs of the abdominal cavity, clearly support this idea.

In 150 cases of pelvic disease, there were only four cases in which displacement of the pelvic organs was present without displacement of one or more of the abdominal viscera, while there were

66 cases in which the stomach and bowels were displaced without any displacement of the pelvic organs. In 26 of these cases there was also a displacement of the kidney, and in five a displacement of the liver. It is evident, then, that visceral displacement of the organs of the lower trunk must be regarded (of course leaving room for exceptions) as a general disorder, affecting more or less the entire contents of the abdomen and pelvis, rather than as a disease confined to one or two of the organs in which the subjective symptoms happen to be most prominently manifested.

How a displacement of the stomach, a kidney, the bowels, the uterus, or an ovary, may occasion disease, is a pathological question which it is not necessary to spend time in discussing, since the disturbance in blood-circulation, and hence in nutritive changes (possibly, also, in the supply of nervous energy), and the development of abnormal and pernicious nerve-reflexes, are etiological factors, the influence of which is too well known and understood to be disputed, and which are likely to come into active operation under the morbid conditions established in an organ crowded by abnormal pressure out of its proper place. Nature has placed each internal organ in the position in which it can do its work most easily and efficiently; and the studies of the results of visceral displacement which have been made by eminent scientific physicians, have shown that to morbid conditions of this sort may be fairly attributable the most serious, and not infrequently the most obstinate, disturbances of some of the most important vital functions, and through them, of all the other functions of the body.

(To be continued.)

EXPLANATION OF PLATES.

PLATE I.

FIGURE 1. Pneographic tracing showing the respiratory movements of a healthy woman. That portion of the curve above the base line represents *expiration;* the curve below the line represents *inspiration.* This tracing was obtained by means of a new form of pneumograph, or pneograph, which represents the whole respiratory movement, and which I have elsewhere described.

FIG. 2. Pneographic tracing furnished by a woman wearing a corset. The subject was the same person who furnished the preceding tracing, and the tracing was made with the same instrument, adjusted in the same manner. The evident increase in the length of the expiratory movement, or rather decrease in the length of the inspiratory movement, as well as the change in form of the expiratory movement, are strongly suggestive of the interference with respiration occasioned by constriction of the waist

FIG. 3. Pneumographic tracing of the upper and lower costal movements in breathing, furnished by a healthy man. The pneumograph employed in taking this tracing was a modified form of the instrument designed by Paul Bert. In obtaining the upper costal movement, the instrument was adjusted at the middle of the sternum and the spine opposite. In obtaining the lower costal tracing, the instrument was adjusted to the sides of the chest.

FIG. 4. Pneumographic tracing furnished by a civilized woman wearing a corset. It will be noticed that this tracing is almost exactly the reverse of the preceding.

FIG. 5. Tracing obtained from a Chippewa Indian woman who had never worn a corset.

FIG. 6. Tracing furnished by a civilized woman who had never worn a corset. It will be noticed that the last two tracings have the same character as the tracing furnished by a healthy man, shown in Fig. 3.

FIG. 7. Tracing furnished by a man wearing a corset. This tracing is practically identical with the one shown in Fig. 4, furnished by a woman wearing a corset.

FIG. 8. Tracing obtained from a healthy dog.

FIG. 9. Tracing obtained from a dog with a corset on. By examination of the last two tracings it will be seen that a healthy dog breathes just as does a healthy man or healthy woman whose respiratory movements are unobstructed, and that a dog wearing a corset breathes as does a woman under the same circumstances, chiefly with the upper instead of the lower portion of the chest.

PLATE II.

FIGURE 1. Diagram of the trunk, showing position of the viscera, after Ziemssen. It will be noticed that the lower border of the stomach

falls at a point about midway between the lower end of the sternum and the umbilicus.

FIG. 2. Diagram showing the action of the diaphragm, front view.

FIG. 3. Diagram showing the action of the diaphragm, side view.

PLATE III.

This plate is a representation of natural figures.

FIGURE 1. Outline of a healthy, well-developed man, thirty years of age.

FIG. 2. Outline of a well-developed woman, of twenty-six years.

FIG. 3. A Greek statue.

FIG. 4. Outline of an Italian model girl.

PLATE IV.

Outlines showing the effect of the corset in destroying the natural symmetry of the figure.

FIGURE 1. Side profile of a young woman who had once been addicted to tight lacing, but had greatly improved her figure by reforming her dress.

FIG. 2. Side profile of the same person with corset on. This tracing shows clearly the influence of the corset in destroying the natural dorsal curve, and producing protrusion of the lower abdomen.

FIG. 3. Front profile of a young woman of seventeen years who had never worn anything tight in her life. The two side sets of lines illustrate the form of the waist with a corset on and with it off. This young woman's waist measure was three inches less outside all her clothing with the corset on, than next the skin with the clothing removed.

FIG. 4. Side profile of the same person who furnished the preceding outline, showing the distortion of the figure and displacement of the internal viscera occasioned by tight lacing.

LESSONS IN BACTERIOLOGY.

BY PAUL PAQUIN, M. D., D. V. S.

LESSON VII. — CULTIVATION OF BACTERIA.

(Continued.)

Part III. — Brood-Ovens and Heat-Regulators.

THE most of bacteria grow well at the usual temperature of a room. For such it is only necessary to expose the cultures in a convenient place inaccessible to children. But there are microbes which develop only, or better, at certain temperatures; and again, it is often necessary to vary the temperature or regulate it, and keep it steadily for definite periods at special points, for particular purposes, as for the production of morphological changes in a given organism, or for the modification of certain characteristic activities.

The maintenance of constant temperature is difficult, and needs very close watching. It is in such cases that a special apparatus becomes necessary, though not exactly indispensable, to control the temperature. This device consists of a check on the flow of gas by the expansion of mercury in specially constructed tubes attached to the brood-oven. A simple, cheap, and satisfactory thermo-regulator is that of Reicherts, which can be purchased from any instrument house, selling chemical apparatus.

But the practicing physician may wish to cultivate bacteria without the outlay of anything near the cost of any of the brood-ovens and regulators for sale in the market. He may do so by constructing a quadrangular box of zinc (see Plate III., Fig. 7,) with three side walls and bottom double, to admit water between. This box may be covered with a non-conducting substance, such as heavy felt or asbestos cloth or cotton-batting, and thus be made easy of control, as compared with a metallic box without such a cover. For this, gas may be used as fuel, but if unable or unwilling to command this article, lard (oil) may be used, as shown in the cut referred to above. Take a large basin, fill it with water to within an inch or two from the top, pour a layer of oil, say one quarter to a half inch, on top of the water, and place upon it one or several small floats with wicks, and ignite them. Of course the flame cannot be varied by any means, so it is necessary to seek and find the right distance at which it should be placed under the bottom of the box. These floaters give a very constant heat. The brood-oven (or thermostat) should be put in a room where the temperature is constant, so as to be affected the least possible by variation. A cellar is a good place.

Lesson VIII. — Bacteriological Analysis of Fluids, Solids, and Gaseous Substances.

Part I.

The microscope alone is inadequate to reveal all that is necessary to know concerning microbes in any given substance. It does not show fully what organisms are present, which are dead, and which alive, to what class or species they belong, whether harmless or pathogenic. So something more than a microscopical examination is needed to complete a trustworthy bacteriological analysis of anything, except in a few special cases, as in the diagnosis of tuberculosis, where technique has so far advanced that microscopic revelations, are positively reliable in almost every case.

It is not my purpose here to go at length into details of laboratory technique, but merely to draw attention to the main points.[1]

The chief instruments necessary in these analyses have already been noted in former lessons, and so have the methods of inoculation and the culture media.

One may become familiar with bacteriological analysis, by studying, first, water, earth, air. In the first place, if it is only desired to abstract pathogenic forms, water may be inoculated subcutaneously in a small susceptible organism; earth may be inserted in a little pocket cut in the skin; the dust of the air and a little sand from the sand filter, (which after sterilization allowed the air to penetrate through, thus retaining its floating particles) may likewise be inserted into a cut aperture in the skin, and perhaps by this means germs will develop locally or generalize throughout the organization, enabling the investigator to find them by microscopical research. But if it is desired to show all the forms, as is usually the case, then it is necessary to have recourse to cultivation.

To cultivate the bacteria of water, a simple means consists of spreading a little of the fluid over plate cultures referred to before, or over the cut surface of sterilized potatoes; if earth, it may be desiccated, pulverized finely, and dusted over the same material; if air dust, as the dust gathered on a plate in a room, the same means may be used. Then put the plates at the ordinary temperature of a living room, and watch for developments. When specks of growth appear here and there, pick them up one by one very carefully with the point of a sterilized platinum needle, and inoculate into separate tubes of cultures, taking all the precaution that the mind will suggest to prevent contamination with air germs in the manipulations that must be resorted to.

Another method is to make streaks across the plate cultures, as already mentioned in a former lesson. (See Plate III., Fig. 4.) For this, the material to study must be in such a state as to adhere to the platinum wire. The fluid or semi-fluid is in proper state, but for earth or solids of other character it may be difficult. Still it may be resorted to with decided benefit, even in studying dry, powdered material. For instance, in analyzing fine, pulverized earth, one may sterilize a platinum, inoculating needle, plunge it in sterilized (distilled) water, dip it in the powder, and then make streaks with it across the gelatine, or the agar-agar plate. The powder that adhered to the needle will stick to the nutrient substance, and the microbes will develop in the little furrows and isolated colonies.

Solid tissues may be mashed as indicated in our previous lesson, and the pulp inoculated. So from this plate culture one must make in test tube (Plate III., Fig. 2), individual cultures with each speck of growth of different appearance (and even similar appearance).

It will be remembered that the object of these analyses is the isolation of the different forms of bacteria, each being isolated in a special test tube of culture. It remains to be seen what are their individual properties. Separate cultures must then be continued for a long time,

[1] See Lesson VII., Page 714, of Bacteriological World, October number, for methods of culture, etc.

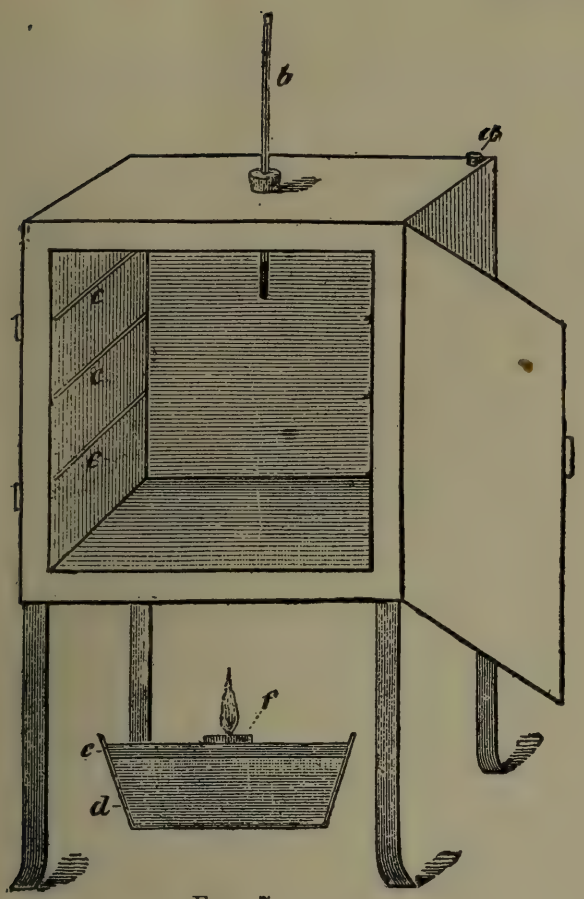


FIG. 7.

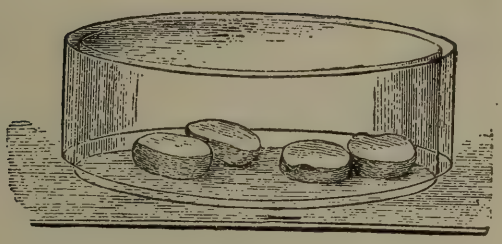


FIG. 6.

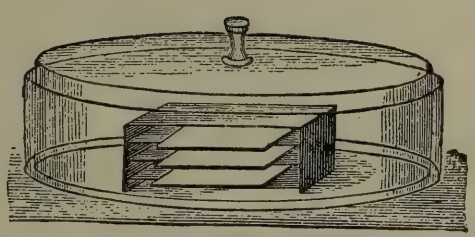


FIG. 5.



FIG. 4

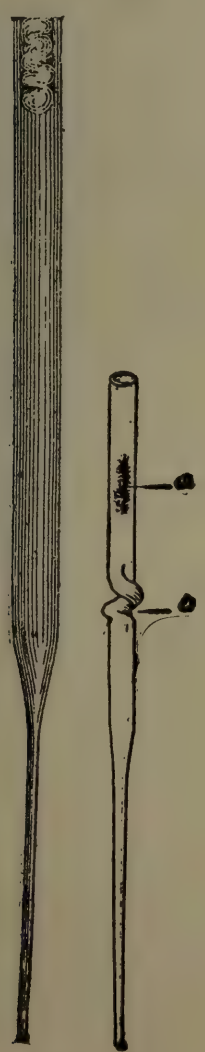


FIG. 1.

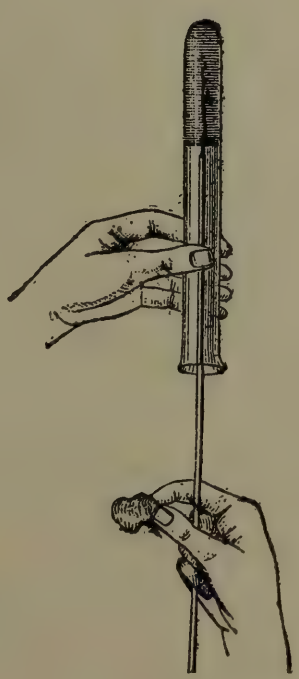


FIG. 2.

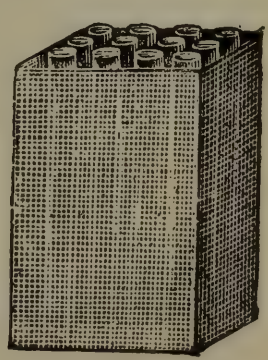


FIG. 3.

PLATE III.

and the attributes and products of each form carefully marked.

Finally, the pathogenic qualities can be determined only by inoculation of each separately in animals.

Now all the different testing means mentioned so far, may fail to reveal all the germs. The anaërobic forms, which prosper better without contact with free air, may not appear. We will see later how these may be isolated and identified.

(*Part II. in December Number.*)

PLATE III.

BACTERIOLOGICAL APPARATUS.

FIGURE 1. Pipettes to gather specimens or for use in laboratory. They are plugged with cotton.

FIG. 2. Inoculating solid medium in test tube.

FIG. 3. Test tube of culture medium in wire basket ready for sterilizer.

FIG. 4. Growth of micro-organisms by colonies, in streaks inoculated across a gelatinous plate.

FIG. 5. Plates of culture as No. 4, standing on superposed glass benches inside glass dish.

FIG. 6. Potato cultures inside glass dish.

FIG. 7. Thermostat (or cheap brood-oven) explained in text, (a.) opening to cavity between walls to admit water; (b.) thermometer; (c.) ridges to hold shelves; (d.) dish containing water; (e.) oil on top of water; (f.) floating wick ablaze.

Bismuth by Enema in Dysentery. — Probably no remedy is any more universally used as a means of relieving gastric or intestinal irritation than the sub-nitrate or sub-carbonate of bismuth. The prompt efficiency of this remedy is in many cases most gratifying to the physician as well as to the patient. The remedy is less valuable, however, when the irritation or inflammation is located in the lower part of the alimentary canal, as in dysentery. Dr. H. C. Wood, of the *University Medical Magazine*, recommends employing the remedy locally in these cases, by enema, injecting into the bowels a large enemata containing two or three drams of bismuth. The remedy is certainly worth a trial.

THE BACTERIOLOGICAL WORLD
AND
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IN January last, when we issued our first number, the outlook was gloomy; few friends dared to risk their fortune and reputation as our collaborators, and fewer still did we encourage in the enterprise, preferring to try to rise by sheer force, labor, and merit than to sail chiefly on the reputation of others. True, we endeavored to secure articles from men of learning, and did succeed in several instances. It was just that we should thus seek to present to our readers the best thoughts on bacteriology, from the best authors and investigators; but, after all, the work was exceedingly difficult, and progress very slow.

Despite all obstacles, however, we have succeeded. The BACTERIOLOGICAL WORLD is to-day established; it has outgrown the creeping period, and begins to walk erect. With this number it appears in a new dress, with the addition of a useful ornament upon its face and great addition to its brain — MODERN MEDICINE. This is the first issue of a new volume of the BACTERIOLOGICAL WORLD and its fused associate, and it marks the beginning of a new era, and the entrance upon a broader field of scientific literature.

We thank our subscribers, who have made this progress possible, and our scientific friends, who, in granting us the assistance of their influential names and meritorious writings, have elevated the tone of our nature, and added power to our feeble voice. We respectfully trust that in the future they will cheerfully continue their interest in our enterprise,

and put some of their best thoughts before the medical world through our columns.

The BACTERIOLOGICAL WORLD AND MODERN MEDICINE will reach 10,000 people monthly. The following by Dr. Kellogg explains our purpose in our old and new fields of labor. P. P.

OUR PURPOSE.

PROBABLY nothing has contributed more to the advancement of medical science in the last quarter of a century than the growing tendency toward specialism and the development of various specialties in medical practice. The rapid accumulation of important and often revolutionary facts in the various departments of medical knowledge, especially within the last twenty-five years, has made it impossible for any one mind to grasp the whole of medical science, and has rendered it necessary that one who would become in the highest degree proficient as a surgeon or medical practitioner, should devote himself to some one particular line of study and research as the only means of attaining the desired end. While it may be conceded that the tendency to specialism has been carried somewhat too far, the great advantages which have resulted from the labors of specialists, must be regarded as one of the most important elements of progress in modern medicine.

The same necessity for special studies and special work which has resulted in the development of so great a number of specialists in medical practice, has given rise to similar classification and division of labor among medical journals, of which we have two distinct classes: Journals devoted to general medical subjects, and those devoted to subjects of particular interest to the specialist. We have journals devoted to surgery, gynecology, pediatrics, ophthalmology, otology, climatology, physiology, balneology, bacteriology, and dietetics; but we have no journal specially devoted to a large class of remedies which in recent years have been coming into prominence, and which might be grouped together under the term "physiological therapeutics." It is the purpose of the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, to undertake to occupy this gap in periodical medical literature. In its monthly columns the subject of physiological therapeutics will be discussed from both theoretical and practical standpoints. Besides its regular discussions of bacteriological subjects, it will treat of such remedial means as electricity in its various forms, hydropathy, dietetics, massage, Swedish movements, medical gymnastics, various applications of heat, sunshine, mental influence, and all other non-surgical and non-medicinal therapeutic remedial agencies. Climatology, meterology, mental, physical, and moral hygiene, and allied subjects, will be discussed so far as they sustain relations of importance to health and disease.

It will be the aim of the editors of this journal to make its pages an epitome of the ablest and most advanced thought, and the ripest experience upon all subjects which come within its scope. The BACTERIOLOGICAL WORLD AND MODERN MEDICINE is not designed for a special class. The subjects to which it is devoted must be of interest to every practitioner who wishes to keep himself abreast with the most advanced lines of medical progress, no matter whether he be a general practitioner or a specialist in some particular line of medical work.

A number of excellent authorities in bacteriology and special lines of physiological therapeutics have been engaged to contribute to the columns of the journal, and it is believed that the reputation of the BACTERIOLOGICAL WORLD, the new scope of the name, and the auspices under which we begin this volume, are such as will guarantee success. Certainly, no pains or expense will be spared to make the journal fulfill its mission to the satisfaction of those who may become its patrons.

J. H. K.

PHAGOCYTOSIS.

Among the factors in producing immunity against disease, is the very interesting phenomenon known as phagocytosis, *i. e.*, the destruction of micro-parasites by microphages of the body,— certain cells of various organs and of the liquids of the economy, such as the spleen, blood, etc. In this war against bacteria, the animal cells englobe the former, swallow them, fill themselves full of them sometimes, until they are enormously bloated, and even split open. The death of the bacteria, and often of the microphages, results, probably from the action of both the products of animal cells and bacterial organisms, for vacuoles of liquid soon form in a microphage containing microbes in its body. The foremost expounder of this factor in immunity is the eminent Russian bacteriologist, Metchnikoff, of Pasteur's Laboratory. We present, in this issue, some striking illustrations of his on the subject. They will prove of interest to all who may study them.

All the figures of Plate I. were made from nature, from charbon in white rats, and appeared in *Les Annales de l'Institut Pasteur*[1] in blue color. They are very greatly magnified, as will be seen by the *Zeiss* lens used.

1. Represents a microphage filled with bacteridia. It is from a sub-cutaneous exudate of four days. Magnified with eye piece 4, objective $\frac{1}{18}$ *Zeiss*.

2. Another microphage of same origin: Eye piece 4, objective $\frac{1}{18}$.

3. A microphage of same exudate with bacteridia in degeneration. Eye piece 4, objective $\frac{1}{18}$.

4. A microphage of same exudate with two bacteridia artificially liberated. Eye piece 4, objective $\frac{1}{18}$.

5. A split microphage of same exudate; *a.* conical bacteridia, *n.* remainder of the nucleus. Eye piece 4, objective $\frac{1}{18}$.

6. A microphage filled with bacteridia. Exudate of the eye 72 hours after inoculation. Eye piece 4, objective $\frac{1}{18}$.

[1] Tome IV., April, 1890.

7. Microphage of same source. Eye piece 4, objective $\frac{1}{18}$.

8. Microphage of same exudate; englobed bacteridia very pale. Eye piece 4, objective $\frac{1}{18}$.

9. Microphage of same origin allowing the escape of bacteridia. Eye piece 4, objective $\frac{1}{18}$.

10. *a.* Macrophage containing bacteridia and leucocytes; *n.* nucleus of the macrophage. Exudate of the eye 46 hours after inoculation. Eye piece 3, objective $\frac{1}{18}$.

11. The remainder of a microphage from exudate of the eye 72 hours after inoculation; *n.* debris of nucleus. Eye piece 4, objective $\frac{1}{18}$.

12. Bacteridia of first vaccine englobed by microphages. Exudate of the anterior chamber of the eye. Eye piece 3, objective $\frac{1}{18}$.

13. Dead microphage with growing bacteridia, in broth. Eye piece 2, objective F. *Zeiss.*

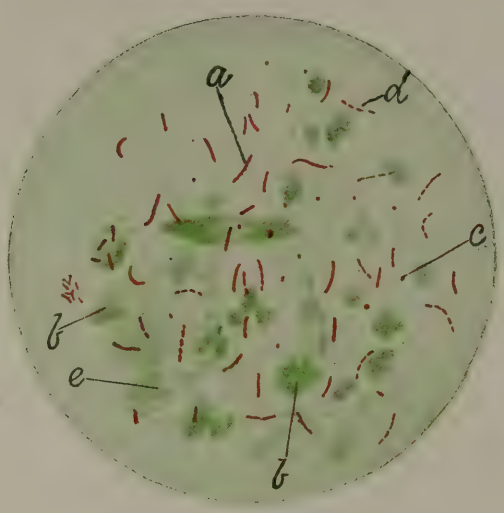
14. Another microphage of the same preparation; *a.* dead bacillus. Eye piece 4, objective F.

P. P.

HOW TO PREPARE KOCH'S TUBERCULINE.

In his fourth communication on the treatment of tuberculosis (*Deutsche Med. Wochenschrift*, Oct. 22, 1891), Prof. Koch explains the method of preparing tuberculine (paratoloid). The process now followed is the following: Culture flasks (Elenmeyer preferred) are filled half full with sterilized veal broth, slightly alkaline, containing one per cent peptone and four to five per cent glycerine, or with a one per cent solution of meat extract. Inoculation of this fluid medium is made with a particle of pure culture. The flasks are exposed to a temperature of 101° F. for from six to eight weeks, *i. e.*, until the culture is completely ripe.

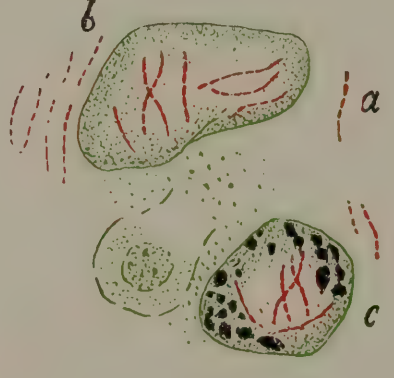
At the beginning, the culture is slow, but gradually some whitish, flat fragments of culture begin to form on the surface, finally grow intensely, and float until about the sixth, seventh, or eighth



1.—BACILLUS TUBERCULOSIS IN SPUTUM A FEW DAYS OLD[1].

The specimen had not been treated by any means to destroy the pus cells and mucus. The microbes are stained with fuchsin and the field (including pus cells and mucus) with aniline green.

a, Rod-Shape Bacillus; *b*, Pus Corpuscle; *c*, probably a Spore; *d*, a Bacillus, showing dots which are probably Spores; *e*, Strings and Film of Mucus.



2.—LONGER BACILLI OF TUBERCULOSIS IN SPUTUM[2].

a, Isolated Bacillus; *b*, Bacilli in Epithelial Cell; *c*, Bacilli in a Pigmented Cell.

PLATE II.

[1] Cut from "*Microscopical Diagnosis of Tuberculosis*," by Dr. Paul Paquin, made from an ordinary mount stained by a process adopted by the author.

[2] Cut from "*Les Bacteries*," by Cornil & Babes, Paris, France.

week; then they fall to the bottom. At this period, the growth is a layer of considerable thickness; its top surface is dry, whitish, and often pleated. It falls to the bottom because the growth stops and imbibition takes place.

Microscopical examination of the culture is then made, and if it is pure, the tuberculine may be prepared. To this end, the cultures are reduced to ten per cent of their primitive volume in a water bath, kept in the neighborhood of 212° F. As this requires hours of heating at about boiling point, the bacilli are all killed. But for greater safety still, the substance should be filtered through porcelain. The tuberculine thus obtained contains forty to fifty per cent of glycerine, which protects it against the invasion of microbes. One has only to protect it, then, from fungi. It may keep its strength and purity for years, doubtless. The germs must be grown in masses in order to obtain reliable tuberculine.

P. P.

THE RELATION OF THE DIAGNOSIS TO THE CURE OF TUBERCULOSIS.

Why should one tenth of the people die of tuberculosis? Is it because this malady is always incurable? — No. Is there no remedy at any stage? — There is. Why, then, do so many die? — It is chiefly because in fifty per cent of the cases proving fatal, physicians fail to recognize the disease early enough, and in twenty per cent of the rest they believe it is inevitably fatal under all circumstances. These facts are the result, on the one hand, of ignorance on the subject of the quickest and most reliable means of diagnosis — the bacteriological methods; and on the other, of the determination of a number of physicians, who, despite mountains of logic and evidence, still refuse to accept truth, and even seek, through the medical press and by popular remarks, to dissuade others from believing in the established facts concerning the causation and means of propagation of the disease. At this date, one who has followed and investigated the question of tuberculosis, experimented with it, weighed all the evidence pro and con, gathered and digested the enormous mass of observations and the results of researches in all parts of the civilized world, reads with amazement the absurd and bold attacks made from time to time, through the medical press, on the revealed truths concerning the nature of tuberculosis. Were it not that ignorance, doubtless, lies at the bottom of most of such antagonism, conscience would feel like classifying the rebellious as guilty of great harm, for they favor a course that hasten the death of their fellow-men.

Tuberculosis, in its incipiency, if not radically curable, may surely be nullified or modified by favorable climatic influences. We owe to our patients all that science can give them to prolong or save their lives. It is exceedingly wrong to guess in making a diagnosis of such importance and responsibility, or wait until the lesions are such as to enable one to make a diagnosis by physical means or any of the old methods, for then it is too late for the subjects to go to a more favorable climate.

The physicians must eventually get into the habit of making their own microscopical diagnoses, as they make their more common examinations. It is not so difficult as is believed, nor is it so costly. Any one can, by the numerous improved bacteriological methods found in works on bacteriology (and some were published in the Bacteriological World the past year), diagnose tuberculosis much earlier than by any other method, with a cheap microscope and a one-sixth objective. One need not be a microscopist for an accurate diagnosis of this character. We beg to draw attention to Plate II. in this issue, giving the common appearance of sputum and the bacilli as revealed by a method of staining used in the Laboratory of Hygiene under the writer's direction.

P. P.

INFECTION OF SURGICAL WOUNDS BY CATGUT.

KLEMM reports (*Bulletin General de Theriapeutique*) some interesting experiments to determine the influence of catgut in producing suppuration. The complete sterilization of catgut is very difficult, and many surgeons have banished catgut from their practice. Notwithstanding we have to-day succeeded in producing catgut absolutely aseptic, by the method of Reverdin, or that of Brunner, suppuration still occurs from time to time, in defiance of the surgeons. At the clinic of Dorpat, since the substitution of catgut for silk, suppuration is frequently observed in the bottom of wounds toward the tenth day, when everything had gone well and a perfect result had been expected. As the work had been done with the greatest care as to asepsis, and as the aseptic character of the catgut had been especially verified, not only with reference to its surface, but also as regards its interior, by culture experiments, Klemm supposed that the catgut, even though sterile, formed in the wounds a favorable culture medium for the development of germs which accidentally entered during the operation. He then made some comparative experiments with silk upon rabbits and cats, by introducing into a wound of the thigh on one side, a thread of catgut, and into a wound of the other side a thread of silk. The strictest antiseptic precautions were taken, and the wound closed by sutures. On opening the wound several days later, he found œdematous infiltration around the catgut, which was swollen, reddened, and odorous. On the side in which the silk was placed, nothing similar was observed. Placed upon a gelatin culture medium, this catgut developed 2,500 colonies; the silk gave only seventy to eighty colonies. Before the operation, these substances were sterile. Infection, then, occurred during the operation. Many different experiments gave the same results. The author believes himself justified in concluding that catgut, even if thoroughly sterilized, must be excluded from surgical practice; for in wounds which are not absolutely protected from germs, it may decompose under the influence of microbes, and cause the formation of an abscess, when silk under the same conditions would produce no disturbance. J. H. K.

HYDROGEN PEROXIDE IN PELVIC ABSCESS.

WE have for a number of years made the use of peroxide of hydrogen (Marchand's) in the treatment of suppurating surfaces, abscesses, etc., with excellent results, but have never observed a more gratifying result than that recently obtained in a case of pelvic abscess of long standing. The abscess discharged by a small opening just behind the cervix uteri, and was very profuse, and extraordinarily fetid. Our stock of peroxide of hydrogen happened to be exhausted at the time, the new supply ordered being somewhat delayed in reaching us, and we at first employed listerine, using it in the proportion of one part to three of distilled water. There was no apparent effect upon the discharge, as regards either quantity or character. The odor continued as bad as ever. When the new supply of peroxide of hydrogen arrived, we immediately began using it in the proportion of one part to ten of distilled water, with the result that after the first washing the intensely fetid odor disappeared entirely, the discharge became healthy in appearance, and diminished in quantity so rapidly that within ten days there was no discharge whatever, except at the washing, and then the quantity evacuated was not more than a dram, when it had previously been several ounces, besides continuous discharge in the intervals between the washings.

After the first washing with peroxide of hydrogen, the patient's temperature, which had for several months previously been above normal, fell to normal and has remained at that point since. There is certainly at present no agent known which

could properly replace hydrogen peroxide as a disinfectant of unhealthy surfaces.

It would seem to be especially valuable in the treatment of abscesses, the discharges of which, through the relation of the cavity and the lower part of the alimentary canal, usually possess so repulsive an odor as to render the existence of the patient almost unendurable.

J. H. K.

The Two Ways in Therapeutics.— In general, there are two methods of treating any disease: —

1. Attempting to meet the various symptoms presented in the case by appropriate remedies.

2. Seeking to aid nature in curing the patient by removing the cause of the disease.

The first method is empirical, the second rational. He who follows the first method is continually at sea, tossed about by every wind and wave of opinion, and continually going on bootless errands after some *ignis fatuus* in the shape of the latest new panacea. The physician who looks underneath the superficial expression of the disease, seeking after the causes which underlie its manifestations, seeks for an explanation of the phenomena of disease in the careful study of physiology and pathology, and bases his therapeutics upon the results of laboratory research, controlled by careful clinical observation, rather than upon the confusing and often contradictory conclusions reached by empirical experimentation. J. H. K.

La Grippe and Consumption.— We trust the article by Prof. Stickler will not be overlooked on account of its brevity. The subject of which it treats is an important one. Four similar cases, in which pulmonary tuberculosis followed quickly upon the heels of *la grippe*, have come under our personal observation. Here is a problem for the bacteriologist to solve: In what does the apparent affinity between *la grippe* and tuberculosis consist? Is it in the preparation of the field for the reception of the tubercle bacilli? or is it that undiagnosed tuberculosis bacilli already in the system are given full sway by the weakening of the tissues by *la grippe?* J. H. K.

THEORY AND PRACTICE.

PHAGOCYTES: THE WARRIOR CELLS.

BY C. VON FALKENHORST.

(*Vom Fels zum Meer, Stuttgart, February.*)

OUR body is a well-organized State. The cells with which life is so intimately bound up, are its citizens, and the number of these citizens is legion. In comparison with the cells in our body, the human population of the earth is insignificant. The red blood corpuscles alone, whose function is to carry and distribute oxygen, are estimated at approximately twenty-five billion in the body of an adult man.

These industrial communities, although shut in from the outer world by a panoply of skin, are by no means secure in the enjoyment of a tranquil existence. Devious highways connect their most sheltered recesses with channels communicating with the outer world, and through these they are assailed by legions of no less insignificant foes, who invade the several provinces of the kingdom to lay waste and destroy. These invaders are the bacteria, which are now recognized as the agents of so many diseases.

Nature has endowed our organisms with forces to resist disease germs, and cases occur daily in which people are restored to health by the agency of these unknown defenders. The cells proper to the system are under investigation, and among them some investigators profess to have discovered warrior cells, which in a certain sense may be regarded as a standing army of defense, and their function being to fall on and devour the invaders, they have been styled phagocytes.

These defenders of the human system have long been known, but their function, until recently, was not suspected. Every one of our readers has heard or read of the white corpuscles in the blood; these are our anti-bacteria military, the most simply uniformed and most simply armed

troops in the world, for they belong to the simplest forms of life. These white blood corpuscles, or leucocytes, are simple naked cells, consisting merely of a speck of protoplasm and a nucleus, but in spite of their simple organization, in spite of the absence of differentiated organs, they nevertheless act as other creatures act.

They have neither fins nor feet, but are, nevertheless, capable of progress. This is provided for by a property of protoplasm which admits of their putting out tentacles in one direction, which tentacles draw the body after them. They seize their food with these tentacles, draw it to them, enfold and assimilate it. The tentacle which serves first to propel toward its prey, and then to grasp it, is finally used as a stomach in which to digest it. The nucleated speck of protoplasm, in spite of this structural simplicity, is further endowed with sensation, and the power of reproduction.

Such are the white corpuscles of the blood. At periods of inaction they present the appearance of colorless, round balls; they are not found in the principal veins, being unable to stem the current. The seat of their activity is in the smaller veins and capillaries, where they wander at will, prey and eat like the beasts of the forest, or the monsters of the great deep. The number of these white blood corpuscles, in a grown person, is estimated at approximately a hundred million. Related forms of the white blood corpuscles, are found in the lymph, chyle, and other fluids of the system, even in the crystalline lens of the eye, where they traverse the interstices of the membrane, like adventurous explorers cut off from the main body of their race.

Similar wandering cells with amœba-like movements are also diffused through the lower orders of the animal kingdom, and in insects, and their study in these forms has led to some very interesting conclusions as to the part they play in metamorphosis and evolution. An opportunity for studying their activity in living forms, is afforded by the larvæ of sea-urchins and star-fish, whose skins are frequently transparent. The Russian zoölogist, Metchnikoff, has established that the leucocytes, in a manner, purify the blood. On the introduction of a speck of carmine or dust, they immediately close themselves upon it. In all evolutionary processes and transformations of the lower animals, there are portions of the tissue which cannot be utilized in the new structure. They are thrown off as debris, and the leucocytes enclose and assimilate them. The same course is pursued in the metamorphosis of the tadpole; the leucocytes congregate in the tail, and consume it. So, too, in the metamorphosis of insects, they perform the function of removing all unutilizable tissue, and practically, of converting it into utilizable material; for these roving cells, at length, weary of their active independent existence, build themselves into the tissues of the organism to provide for growth, or for repair of the waste of decay.

On account of their habits Metchnikoff called these cells phagocytes, that is *devourers*, and as we have seen, they constitute an organized sanitary police.

The phagocytes prey also upon all foreign substances in the system, and consequently upon all invading bacteria and disease germs.

But the phagocytes are by no means invincible. They, too, are liable to defeat, and it is observed that the phagocytes of different animals vary in their attitude toward bacteria. Indeed, some investigators are of the opinion that the invading armies in warm-blooded animals, prey on the white blood corpuscles; but even those who reject the phagocyte theory, admit that there are cells proper to the system which oppose the invaders.

Bacteriology is the youngest branch of the tree of knowledge. It has already achieved many triumphs, and will doubtless soon solve the riddle of the precise relation of the micro-organism to the cell. If at first glance it seems shocking to reflect that our bodies are the seat of vast communities who rove over it as over their

own domain, it should console us to reflect that in the pursuit of their own well-being, they are undesignedly efficient agents in achieving ours also. In fact, they are an army of sanitary police evidencing individually intelligent purpose in the overthrow of numerous foes, against which man himself has hitherto been powerless, and whose tactics he does not even understand. — *The Literary Digest.*

THE CAUSE OF RHEUMATIC DIATHESIS.

(Abstract of a Memoir by F. P. Le Roux, Academy of Science, Paris.)

In the present memoir I present the series of observations which have brought me to conclude that the cause of the rheumatic diathesis resides in the invasion of the intestines, by masses of zoöglœa, better known under the name of intestinal mucus. The prevailing opinion has hitherto been that these productions are the exudate from the intestinal mucous membrane, a mucus more or less dense, of which the greater or less abundance is an effect, and not the cause, of the disease. In addition to the mucus, properly so-called, the presence had also long been observed of products, membranous or lamellar in structure, which had been considered an epithelial desquamation from the intestine. In addition, there had been mentioned some tubular products rarely observed, the form of which was thought to be due to a simultaneous desquamation of the whole surface of the portion of the intestine. In his work entitled, "Traité des Humeurs," Robin mentions some curious examples of the last-named product.

Since my childhood I have had to battle against rheumatism under its generally recognized manifestations, and believe that I have discovered something new in the symptoms of this disorder. The present work, then, may be regarded as a conclusion of a series of observations covering a period of fifteen years. It was on the occasion of an attack which was pretty likely to prove fatal, that I was able, about three years ago, to discover the connection of certain morbid manifestations with the presence in the intestine of the mucous products referred to. I have set myself to dislodge these mucous products, to collect them, and to observe their forms.

The mucous bundles present themselves in various sizes, preserving constantly analogous forms, which preclude the idea of casts. The arrangement is that of membranous ridges arranged around a very narrow trunk of tubulous appearance. When by appropriate medicines one secures their expulsion, so that the mucous membrane of the intestine is cleansed, they may be gathered in the form of small masses of an amber color. In the water, these masses unfold themselves, and the bodies in question increase in size by the absorption of water. Everything indicates that these cylindrical masses come from tubulous pouches more or less elongated, which I have called generating tubes.

These matters, including the generating tubes, become considerably swollen under the action of a solution of tannic acid. Salicylic acid contracts them, etc. By means of tannic acid, salicylic acid, or with a solution of a copper salt, I have been able to remove from the intestine, generative tubes which had resisted during many years the purgative agents ordinarily employed. It was only after the elimination of a great quantity of these generative tubes that I was able to secure any considerable improvement in health.

Microscopic examination shows the mucous masses produced to be principally formed of a zoöglœic mass of micrococci (which I propose to call micrococcus glareæ), surrounded with mucilage and mixed with certain bacteria appearing to form colonies.

The poisonous properties of the mucous masses appeared at first to result from the fact that their passage into the intestine, which in certain cases may be accurately observed, produced morbid symptoms al-

most simultaneously, some of which were general, others local. The connection of all the morbid manifestations called rheumatic, with the presence in the intestine of these products, is shown by the observations reported in my memoir.

Are these mucous products toxic, in themselves? or not being in themselves toxic, do they serve to support the growth of other species of bacteria which are toxic in character? or, again, do both the conditions supposed, exist at the same time? The last hypothesis appears to me the best, but I advance no definite theory upon this point.

How is the system attacked by these morbid products? Have we to deal with one or many toxic secretions, and is it not possible to suppose that there may be a dissemination of spores throughout the system? This is a question which is reserved for the future.

However this may be, I have established by daily observations upon myself, and upon other patients, that a great number of symptoms, more or less recognized as belonging to the rheumatic diathesis, have a certain concomitant relation with the greater or less quantity of mucous products with which the intestine was burdened. The capricious behavior of rheumatic attacks, and of affections which depend upon them, are easily explained if one observes that the generative tubes may act as storage chambers of greater or less capacity. These magazines empty their products into the intestines, in some cases nearly uniformly, so that the manifestations of the disease are moderate. In other cases the discharge of the contents of the generative tubes occurs irregularly. In these cases the excretory organs are not able to eliminate the poisons which accompany the mucous masses with sufficient rapidity, in consequence of which their effects upon the system are much more grave.

The most prominent morbid symptoms that can be connected with these causes are, after the pain and ulcerations of all the muscles, aponeuroses, tendons, etc., migraine, a certain variety of obesity caused by thickening and induration of the skin and subjacent muscles, inflammation of the salivary glands; then resulting from the muscular ulcerations, gastralgia, dilatation of the stomach, lessening of the expulsive force of the bladder; but the symptom especially general and characteristic is the generalized chronic inflammation of the blood-vessels bringing, as a final result, hemorrhages, and in particular cerebral hemorrhages.

I have known a simple expulsive treatment to produce an amelioration of the general state, on condition of being employed daily; but some years perhaps will be required to bring about a radical cure.

Experience has shown me that to obtain the most rapid and permanent results it is necessary to employ an alterative plan of treatment which will attack the generative tubes. I have been able to dislodge some of them contained in the sigmoid flexure, by means of irrigation made with solutions of tannic acid or a copper salt; but in myself there existed other colonies situated much higher in the intestine. In the attempts which I have made to attack them simultaneously by the stomach and the intestine, tannin from nut galls has seemed to me to be the most active of similar substances.

BOUCHARD'S BATH IN TYPHOID FEVER.

The efficacy of the cold bath as a means of shortening the duration and lessening the mortality of typhoid fever, has been clearly shown by Brand, Liebermeister, Winternitz, Ziemssen, and others. Brand administered a bath at a low temperature eight times a day, whenever the temperature of the patient rose above 101½° F., continuing the bath ten or fifteen minutes. Liebermeister employed a bath during the whole course of the disease, administering it twelve times a day, from ten to fifteen minutes each time. He made the temperature of the bath from 59° F. to 68° F. The patient

was left in the cold bath until the condition of rigor was well marked. Sometimes the condition of the patient became very alarming, and his suffering was always very great; nevertheless, the mortality was lessened.

Ziemssen rendered the bath less disagreeable to the patient by gradually cooling it. He began with a temperature of 95° F. and lowered the temperature rapidly to 77° F., then allowed the patient to remain in the bath from ten to fifteen minutes, until his teeth chattered and he was thoroughly chilled. When used in this manner, the cold bath produces a violent nervous shock and spasmodic contraction of the blood-vessels of the skin, which lessens in a marked degree the peripheral circulation. As the result, although the patient's temperature lowered, it was found to be increased shortly after the bath, not infrequently reaching a point even higher than that before the bath. Riess suggested and employed a continuous bath at 88° F. This form of bath lowers the temperature of the patient and lessens the mortality of the disease, but is exceedingly tedious for the patient.

Bouchard has proposed a form of bath which produces no nervous shock, or spasm of the cutaneous vessels, and which thus encourages the elimination of heat from cooling of the blood while circulated in the vessels of the skin. We quote the following description of this bath from his work, "*Leçons sur les Auto-Intoxication dans les Maladies:*" —

"The initial temperature of the bath should be 3½° F., below that of the body, —100° F., for example, if the patient's temperature is 103½° F. At this temperature the patient is comfortable, and experiences no shock. The water should be cooled very gradually, at the rate of one fifth of a degree per minute, that is, 2° F. every ten minutes, until the temperature reaches 86° F., never lower.

"No sensation or nervous shock, no vascular agitation, occurs during this long time. The pulse does not become contracted; . . . there is none of the stupor peculiar to typhoid fever. The lowering of the temperature secured is much greater than that of the cold bath.

"I give the bath eight times a day. Some patients thus pass half the day in water. The lowering of the temperature is much more durable than the cold bath. The elevations of temperature are much less considerable."

Bouchard thinks that by this means he is able to secure a lowering of temperature of at least 1° F., and sometimes more than 5° F. The elevation of the temperature after the bath is very slow, and never occurs quickly. The higher the temperature the greater the effect of the bath, with the exception of cases of excessively high temperature, as 103½° F. to 105° F. There is also but little effect in cases in which the temperature is 100° F. or below, and upon a person whose temperature is normal, there is practically no effect.

GLOBULICIDE POWER OF THE BLOOD SERUM.

M. Daremberg recently reported to the Academy of Sciences, Paris, the results of some interesting physiological studies respecting the influence of the blood serum upon blood corpuscles. *La Semaine Medicale* summarizes his work as follows: —

"The physiological study of the blood serum has taken recently a new direction. It has been shown that the serum of many animals exercises a destructive action upon a certain number of microbes. The serum of animals vaccinated against diphtheria and tetanus, is even capable of destroying the tetanic poison and the poison of diphtheria. It has also been observed that these remarkable properties of the serum disappear under the influence of different physio-chemical actions,— heat, light, etc.

"There is another property of the blood serum observed long ago by Creite, Landois, Panum, and Hayem. This is the power possessed by the blood serum

of one species of animals to destroy the red globules of the blood of an animal of another species. We have made a comparison of this power of the serum to destroy foreign red globules, which we will call briefly the globulicide power of the blood, with the destructive action of the serum upon microbes, or microbicide power.

"If we place upon a slide two or three drops of blood serum from a dog, deprived of its red globules by coagulation, or more certainly by the action of centrifugal force, and then mix a trace of the blood of a guinea-pig or a rabbit, the red globules of these animals will be seen to disappear in two or three minutes as if they were dissolved. The globules may be preserved indefinitely in the serum of an animal of the same species.

"If one mixes with the serum of a dog, a trace of blood from a pigeon or a frog, of which the red globules are nucleated, the globules are seen to loose their coloring matter, and become, in from twenty-five to thirty minutes, reduced to their nuclei.

"The serum of the ox, the pigeon, and the tortoise, possesses the same destructive power for the red globules of an animal of another species. The serum of a rabbit has generally very little globulicide power for globules of the *Mammifera*, of birds, or batrachians. The globulicide power of the serum is invariably destroyed by heating from 122° F. to 140° F., as is also its bacteriacide power. Even after five minutes exposure to this temperature, the globulicide power begins to lessen sensibly. After from twenty-five to thirty minutes' heat, it completely disappears. Temperatures below 122° F. do not affect the globulicide power of the serum. Serum exposed to a diffused light for from eight to ten hours, loses its globulicide power. Serum placed in the presence of a trace of essence of garlic for some hours also completely loses its globulicide power. This globulicide power of the serum is slightly retarded by traces of corrosive sublimate, of paraldehyde, and the vapor of mercury. It is also modified by traces of ether, or alcohol, either amylic or ethylic, and other substances. The white of an egg has no lobgulcide properties.

"M. Gilbert has called attention to the fact that the normal blood serum of man is eminently conservative of normal blood corpuscles, and also of the degenerated red corpuscles of anæmia. On the contrary, as shown by Maragliano, the serum of invalids suffering from various infections maladies, as well as the serum of anæmic patients, has a very marked destructive action upon both normal and pathological red corpuscles.

"These observations suggest that the lessened number of red corpuscles and the various modifications of the corpuscles observed in anæmia, and especially in chlorosis, are due to a previous alteration of the serum."

Unfermented Breads for Dyspeptics. — The inability of dyspeptics to digest bread, so frequently observed, is often wrongly attributed to an incompatibility of farinaceous substances with this disease. As a rule, farinaceous substances are particularly wholesome for the majority of the subjects of dyspepsia. The dilated stomach is unable to deal successfully with food substances which require much disintegration, and which require long digestion in the stomach. Farinaceous foods are readily disintegrated in the stomach, and quickly reduced to a state proper for admission to the small intestine, where their digestion is chiefly performed.

The reason for the disagreement of breads with dyspeptics has been clearly pointed out by Bouchard, Dujardin-Beaumetz, and others. It is not that the bread contains starch, but that it contains microbes capable of converting starch into a variety of irritating acids and other poisonous products. Speaking of the use of fermented bread by dyspeptics, especially those with dilated stomachs, Bouchard remarks: —

"In the use of bread, the crust alone should be permitted, or the toasted crumbs. The reason for this is that the baking of the bread has interrupted the fermentation of the dough, but has not permanently arrested it; so that fermentation begins again as soon as warmth and moisture present the favorable conditions. In torrified bread (zwieback) fermentation is, on the contrary, permanently arrested.

"What is panary fermentation? The general idea respecting this subject is that formulated by Graham. In the presence of cerealine (diastase), starch divides into maltose and dextrine. The maltose under the influence of saccharomyces minor is converted into dextrose and levulose. These two sugars under the influence of saccharomyces, ferment to produce alcohol, and the carbonic acid gas which raises the bread.

"M. Duclaux, who has accepted this theory in principle, denies, however, the existence of alcohol in this form of fermentation.

"The question has been taken up by M. Chicandart. According to the result of his researches, neither soluble starch nor dextrine are to be found in dough undergoing fermentation. Neither sugar nor alcohol are found, but acetic, butyric, and lactic acids. The butyric and lactic acids are found even when pure gluten is fermented. There are also found leucin, tyrosin, and phenol, that is, the products of the fermentation of an albuminoid substance. It is, then, the gluten of the dough which gives rise to the products of acetic fermentation, in the presence of the bacillus glutinous. This microbe resists the temperature to which the center of the loaf is exposed during the baking, and may continue in the stomach the process of acetic fermentation. A knowledge of these facts shows the utility of unfermented bread, and of grilled, or twice-baked, bread in the dietary of dyspeptics."

It will be seen that this is amost interesting topic for investigation.

Tuberculosis by Heredity.— Since the bacterial origin of tuberculosis has been established, the old views respecting the hereditary character of the disease have been losing their hold upon the professional mind, and the heredity of tubercular consumption, formerly considered an established fact, has come to be regarded as nothing more than the inheritance of a constitutional susceptibility, or morbid tendency. According to the facts recently submitted by M. Landouzy, in the *Revue de Medecine*, the old view may be correct after all, and we may have been too hasty in our conclusions respecting the possibility of the direct transmission of the disease from mother to child. Here are some of the facts deduced by the author to prove the direct hereditary transmission of tuberculosis:—

1. The author and M. Martin showed by experiments made in 1883, that tubercles could be produced in guinea-pigs by inoculation from a fœtus, the mother of which was tuberculous, although the fœtus showed no signs of tubercular disease.

2. Birch-Hirschfield and Schmorl recently reported a case in which tubercle bacilli were found in the fœtal liver and in the placenta.

3. Johne and Malvoz have also made a similar observation in the fœtal calf.

4. It has been shown, experimentally, that anthrax bacillus may be transmitted to the calf through the cow.

5. A case is shown which indicates that the fœtus may also be infected from the paternal germ, although the mother remained healthy.

The author concludes, from the facts referred to, that the offspring of tuberculous parents may be affected in two ways:—

1. By actual infection with the bacillus, the development of which may be hastened or retarded by various circumstances.

2. By receiving a peculiar susceptibility from the parent, which renders the system a favorable soil for the development of the bacillus. Such children, if they survive

parturition, die early of congenital debility. In the opinion of the author, tuberculosis in relation to marriage, is as much a question of hygiene as syphilis and marriage.

A New Communication from Prof. Koch.— Under date of October 22, Prof. Koch gave to the medical profession a fourth communication upon the treatment of tuberculosis by tuberculine. In this paper, he not only gives the minute details necessary to enable any competent bacteriologist to produce the lymph as well as himself, but details some very interesting experiments which he has made for the purpose of separating from the lymph the active principles to which it owes its peculiar properties. After many unsuccessful attempts, he finally succeeded in extracting a large part of the active principle of the lymph by the addition of one and one half volumes of absolute alcohol, washing the deposit thus obtained with an equal quantity of 60 per cent alcohol. By this means he obtains a substance which has, when administered to guinea-pigs, fifty times the potency of tuberculine, and when administered to man, forty times the efficiency of tuberculine.

The chemical constitution and properties of the extract of tuberculine thus obtained are found to correspond in character neither to ptomaines nor toxalbumins, and is placed by Prof. Koch in the group of albuminoid matters. He considers it possible that among the products of other microbes, similar substances may be found.

For some months, Prof. Koch has experimented at the Moabite Hospital, in Berlin, with the pure product obtained by the method described, but finds it in no respects different from tuberculine. The fact is somewhat disappointing, as the hope had been entertained that the unpleasant symptoms which often follow the use of tuberculine, and which render the results of its employment so uncertain that most conservative physicians have declined to resort to its use, might be eliminated by the removal of foreign substances or poisonous principles not essential for the production of the specific effect sought in the use of this remedy.

Prof. Koch's article appears in the *Deutsche (Med.) Wochenschrift* for October 22, 1891.

Experimental Researches Relating to Sugar. — Albertoni, of Bologna, has recently reported, according to the *British Medical Journal*, the results of some very interesting researches, undertaken for the purpose of ascertaining the effect of sugar upon the system, when taken in various quantities and under various conditions. The animals experimented with were dogs, which were killed one hour after being fed. The following is a concise summary of the facts observed:—

1. A very considerable quantity of unchanged sugar was always found in the stomach. Of glucose, 60 per cent of the sugar taken was absorbed within an hour, the total quantity taken in each experiment being about three ounces; of maltose, from 70 to 80 per cent was absorbed; of lactose, the proportion absorbed was from 20 to 40 per cent.

2. The amount of water contained in the stomach in the case of lactose was greater than that introduced, especially when the concentrated solution was employed. This evidently explains the laxative character of lactose.

3. The intravenous injection of grape-sugar (cane-sugar and maltose) increased the pulse from 15 to 20 beats.

4. In man, three ounces of cane-sugar, taken by the mouth, increased the pulse from 4 to 8 beats per minute.

5. Glucose, maltose, and cane-sugar increased the blood pressure in dogs from 15 to 20 millimeters of mercury.

6. Sugar introduced directly into the blood, caused dilatation of the vessels of the kidney.

7. Lactose and levulose acted differently from a mixture of glucose, lactose, and saccharose, increasing the blood pressure

but diminishing the number of pulse beats.

8. All sugars, with the exception of levulose, produced polyuria.

The last-named facts lead to the suggestion that levulose might be properly employed as a sweet in cases of diabetes, and Kults has thus used it, although with what results is not reported. The result of experiments now in progress in the Laboratory of Hygiene will be reported at an early day.

Berlin Methods of Antiseptic Dressing.— According to Dr. Keiffer, dry dressings are employed in Berlin for nearly all wounds. The dressing used is either plain sterilized gauze, iodoform, or carbolic or sublimate gauze. Solutions of corrosive sublimate, varying in strength from 1–1,000 to 1–10,000, and from 3 to 5 per cent solutions of carbolic acid, are used for opening contaminated wounds. Strong solutions are used for cleaning the skin about the field of operation.

Lysol, a new antiseptic, in from ½ to 1 per cent solution, is used for disinfection of the hands, instruments, and for daily vaginal douches. The advantages possessed by this antiseptic are that it saponifies fats, has a less disagreeable odor than carbolic acid, and is a good and efficient disinfectant in the weak solution named.

Many surgeons have abandoned the use of sponges, and use instead crumpled gauze.

Catgut, after having been abandoned, has again come into use. Many plans are employed for the disinfection of catgut, one of the best of which is that used by Martin, who places the catgut for twenty-four hours in a solution of sublimate 1–1,000, then preserves it until required for use in a mixture of two parts of alcohol and one part oil of juniper.

How to Give a Fomentation. — Doubtless every physician knows how to apply a fomentation, yet the following suggestions may be of value to some one: A flannel cloth may be folded, wrung out of hot water, and applied directly to the skin; nevertheless, it is much better, after wringing out the flannel as dry as desired, to fold it in a dry flannel cloth of one or two thicknesses before applying it to the patient. A little time is required for the heat of the fomentation to penetrate the dry flannel, and thus the skin is allowed an opportunity to acquire tolerance for the heat, and a greater degree of temperature can be borne than if the moist cloth is brought directly in contact with the surface. The outer fold of dry flannel will also serve to keep the cloth warm, by preventing evaporation.

A fomentation is sometimes needed when no hot water is at hand. It is not necessary to wait for water to be heated in the usual way. Soak the flannel in cold water, wring as dry as desired, fold in a newspaper, and lay upon the stove or wrap it about the stove pipe. In a few minutes it will be as warm as the patient can bear. The paper keeps the pipe from becoming moistened by the wet flannel, and at the same time prevents the flannel from being soiled by contact with the pipe.

Fomentations thoroughly applied will relieve most of the local pains for which liniments, lotions, and poultices are generally applied, and are greatly to be preferred to these remedies, since they are cleaner, and aid nature more effectually in restoring the injured parts to a sound condition.

A New Remedy for Tuberculosis.— Remedies for tuberculosis in its various forms are quite numerous now-a-days. The latest suggestion is that of M. Nodaud, who employs aristol hypodermically, and claims for it remarkable results. He uses a 10 per cent solution of aristol in sterilized oil of almonds. He reports a case of tuberculous disease of the hip joint cured in twenty-five days; and of twenty-three patients suffering from pulmonary tuberculosis treated, claims to have obtained in seven cases a practical cure, the patients having remained well

for three or four months. In five cases there was great improvement; in three cases no effects. In these cases there were large cavities in the lungs. Six patients were slightly improved. The treatment in the cases cured was continued from twenty-five to thirty days. The author summarizes his experience with aristol as follows: —

1. Aristol is a toxic when administered hypodermically.

2. Its elimination is chiefly through the lungs.

3. It acts as an antiseptic and an alterative.

4. Its effects are very prompt, and after the fifteenth or sixteenth day there is a diminution of the froth and suppression of the night sweats.

5. After twenty or twenty-five days' treatment, the patient usually begins to increase in weight.

6. This remedy is useful in the first and second stages of pulmonary tuberculosis, but is of little or no value when large cavities exist, and there is very little expectoration.

7. Injections do not produce inflammation or abscess at the point of puncture. The treatment is not painful.

We shall look with interest for further results from the use of this new remedy.

Influence of Bromide of Potash on the Liver.— M. Fere recently reported to the Society of Biology, the results of researches conducted by himself and M. Herber, which show that when bromide of potash is administered for some time, the drug accumulates in the liver. The results obtained by the authors named differ from those published by other experimenters, which indicated an accumulation of the drug in the brain.

Antidote for Viper Wounds.— According to the *Journal D' Hygiene*, Dr. Kauffman, Professor in the veterinary school of Alfort, near Paris, recently obtained a prize from the Academy of Medicine for a memoir upon viper poisons. The learned naturalist states that chromic acid is a sovereign remedy in cases of poisoning by the viper. According to his experiments, the acid must be introduced into the wound. It should be employed in a one-per-cent solution. When used in this proportion, no caustic effect upon the tissues is observed. The remedy has been tried with success.

Cold as a Caustic.— The London *Lancet* reports the invention, in Germany, of an instrument for the utilization of cold as a means of producing caustic effects similar to those of intense heat. The advantages of this method of cauterizing in certain classes of cases will be at once apparent. It cannot, however, completely replace the Paquelin thermo-cautery, or electric cautery, since the latter not only devitalizes but destroys the tissues, and at the same time renders them absolutely sterile, a fact of no small value in certain surgical cases.

Implanting Artificial Teeth.— Dr. Znamensky, of Moscow, Russia, has been experimenting upon the implantation of artificial teeth in dogs, with excellent results. A tooth which had thus been implanted could not be shaken or removed by any force which could be applied with the fingers. He has performed the same operation in one case upon a human being, with good results. Dr. Rainey, of Illinois, has been experimenting in a similar line, using roots made of block tin, and obtained good results.

Cold Water in Dysentery. — Dr. H. C. Wood calls attention to the value of a large enema of cold water in the treatment of dysentery. We have made use of this valuable remedy for the last fifteen or sixteen years, and with excellent success in many cases. In some instances we find the use of hot water preferable. Our practice is to employ hot water first, as the best means of cleansing the diseased surface. If this does not give prompt relief, cold water, or even ice water, is em-

ployed in as large a quantity as the patient can readily retain. This remedy is especially valuable when the disease is located in the lower part of the colon. Dr. Wood sometimes employs ice suppositories, which he introduces in rapid succession, usually one every three to five minutes until eight or ten have been introduced.

Origin of Suppuration in the Antrum of Highmore.— Dr. Luc, of Paris, maintains that suppuration of the antrum of Highmore is due to infection from carious teeth, and recently reported to the French Society of Laryngology, twenty cases demonstrated to be from this origin. One case proved to be an exception. There was no caries of the teeth, but the patient had had, several months before, erysipelas of the face. After the evacuation of the contents of the sinus by operation, the patient had a new attack of erysipelas of the face. Examination of the pus showed the presence of the streptococcus of erysipelas.

Radical Cure of Inguinal Hernia in Infants. — Karewski (*Centralblatt fur Chirurgie*) recommends radical operation for the cure of hernia in young infants, a complete cure by bandage being so rarely obtained, and the condition so liable to relapse even when an apparent cure has been obtained. He thinks the bad results heretofore obtained in operations upon young children have been due to the suture of the wound in layers, which, while useful in adults, is not appropriate to the tissues of infants. He recommends, after laying the parts open, to reduce the contents of the hernia, to free the sack from the surrounding tissues up to the internal ring, then to twist the sack and ligate it. He uses a tampon of iodoform gauze. The suture is then closed, and the drain left for a few days, to avoid the possibility of sepsis. He reports good results in nine cases.

CAUSE OF DIABETES.

Recent studies of this subject have shown a probable important relation between disease of the pancreas, and diabetes. A discussion on pancreatic diabetes recently occurred in the French Academy of Medicine. M. Lancra (*L'Union Medicale*) showed a dog in which diabetes had been produced by the complete removal of the pancreas. It was maintained that total destruction of the pancreas, without removal, does not produce the same result as removal of the organ.

M. Sée expressed the opinion that there is a pancreatic diabetes, but that all cases of diabetes in which there is a marked tendency to emaciation, are not of pancreatic origin. According to the experiments of Hedon, the absence of pancreatic juice does not produce this form of diabetes. According to the experience of M. Sée, the best anti-diabetic remedy is antipyrine in doses of sixty grains daily, during eight or ten days.

M. Ollivier recognizes a hereditary form of diabetes.

M. Sammola considers diabetes and glycosuria as not the same thing; the presence of sugar in the urine being only one of the symptoms of diabetes, a symptom sometimes found when diabetes does not exist.

M. Boccardi has shown that certain changes in the nerve centers follow the complete destruction of the pancreas.

M. Sée considered the presence of sugar in the urine an infallible sign of diabetes.

M. Loncreaux defines three kinds of diabetes: The constitutional form in which the patient is adipose, the pancreatic diabetes, and nervous or chromatic diabetes. He does not consider hereditary diabetes as a special type, but considers that glycosuria and diabetes may be regarded as distinct conditions; for persons in whom the appearance of sugar is only occasional, after a time become diabetic.

It is possible that the so-called pancreatic diabetes is really, after all, only a nervous diabetes.

REVIEWS.

Practical Pathology and Morbid Histology.— By Heneage Gibbes, of Ann Arbor. Published by Lea Bros., Philadelphia. This work is very practical, and is a capital exposition of the essentials of pathology and morbid histology. One could scarcely find elsewhere as much practical information condensed in 300 pages, on the subjects of which this volume treats. It comprises three parts; viz., Practical Pathology; Practical Bacteriology; Morbid Histology; Photography with the microscope. In these days, when every physician should have some practical information on all these questions, and when much study and a vast amount of literature is necessary to obtain it, this work will simplify and shorten the labors very much. For many reasons, it will be found of much utility also, in every laboratory; its illustrations are all from photographs, and though not all perfect, will improve our knowledge on many things which are usually shown by drawings, often more or less inaccurate.

The Annual of the Universal Medical Sciences.— By Chas. E. Sajous, etc. Five volumes. Published by F. A. Davis, Philadelphia. This is a masterpiece in every respect. An attempt to do it justice in a review would necessitate several months of close study, for it is a complete, lengthy though concrete, exposition of the status of the progress of medicine in the world, since the annual of 1890. It is, besides, very practical and adapted to the physicians' needs. Dr. Sajous and his *seventy* associate editors, deserve more congratulations and praise for this work than the whole medical press could bestow; and the publishers deserve the thanks of all interested, for their admirable illustrations, typography, binding, etc. There has not appeared a medical work in the English language, in the expiring year, so replete with information on all the departments of medicine, which every physician seeks daily, and needs continually, in his ministration to the sick. It is a sort of cyclopedia of advanced thought and progress in the medical world. No physician should be without it.

The Supreme Passions of Man.—By Paul Paquin, M. D. Published by the Little Blue Book Co., Battle Creek, Mich, price 65 cents. It is an original essay of nearly two hundred pages, which places the primary influence producing passions, including drunkenness, in the inherited tendencies of the cells and their daily replenishing by foods and stimulants. It holds that rich foods and exaggerated diet furnish the essential grounds for passion, and that all of these, including drunkenness and the various crimes of the flesh and their well known train of fearful diseases, could be absolutely controlled by science under medical guidance. It brings forth the peculiar and perhaps untold idea, that alcoholism often begins with impressions given to the cells by alcohol formed in the stomach and intestines by microbic fermentation of undigested food. It contains some radical views worthy of every physician's consideration in most of its chapters, particularly in those entitled, "Appetites and Passions," "The Chemistry of Passions," "The Evolution of Sin," "Beneath the Cloak of Marriage," and "The Solution of the Liquor Problem." It is a work that, in our dilemma on the diseases due to passions, abortions, etc., is unique and needed.

It is illustrated by a map of cells intended to impress the popular mind with the truth of cellular aggregation forming the body, and forming the base of its activities. It is radically different from any medical work we have ever seen on the questions treated.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., NOVEMBER, 1891.

LABORATORY OF HYGIENE AND ITS OBJECT.

FOR several years the managers of the Sanitarium have had in contemplation, the establishment of a Laboratory of Hygiene for the purpose of carrying on, on an extensive scale, investigations in matters relating to health and disease, studying especially such questions as have an important relation to diet and regimen. A small laboratory was equipped some two years ago, and some work has been done in this direction; but the great obstacle hitherto in the way has been the lack of a competent director to devote his whole time to this line of research. The right man has at last been found, in Dr. Paul Paquin, the well-known Professor of Bacteriology and instructor in the State University of Missouri, located at Columbia.

Prof. Paquin made a visit to the Sanitarium during his summer vacation, and became so much interested in the work of the Institution, and the lines of investigation which it is desired to carry on here, that he consented, at the solicitation of the managers of the Sanitarium, to offer his resignation to the curators of the University, and undertake the important work of organizing upon a broad and scientific basis, the Sanitarium Laboratory of Hygiene. The laboratory is subdivided into a number of departments, as follows: —

A Physiological Department, in which will be studied the various vital functions of the body, which are capable of experimental study. The subject of digestion will receive special attention.

A Bacteriological Department, in which will be cultivated and studied all known forms of bacteria, or germs. The relations of bacteria to food, water, air, and contagious diseases, will be studied with minute care, and by the aid of all the resources afforded by the most recent and reliable researches upon this question.

A Pathological Department, in which special study will be made of diseased conditions, and the causes of such diseases as consumption, cancer, and other grave maladies.

A Chemical Department, a necessary supplement to the work of the other departments of the laboratory.

A Vaccine Department, in which will be produced, to begin with, the means of protection from smallpox, and later, charbon, black leg, and that most terrible of all known diseases, hydrophobia. The purpose of undertaking the preparation of bovine vaccine in this laboratory is a scientific one rather than one related to commercial interests. It has been discovered, and clearly demonstrated by Prof. Paquin, before the American Health Association, that the severe inflammation, and other symptoms of poisoning which not infrequently follow vaccination, and which sometimes, though rarely it is true, result fatally, are the result of the introduction into the system of poisonous microbes which are not found at all, or in very small quantities, in safe vaccine matter, and which are not essential to its activity and

efficiency. Means have been perfected by which vaccine may be produced as free from dangerous germs as possible,[1] so that the great objections which have been urged against vaccination may be wholly removed, and this efficient means of protection against smallpox may be employed with perfect safety.[2]

Prof. Paquin is eminently qualified for these lines of research by long residence in Paris, and study in foreign laboratories whose names are world famous for their researches and discoveries in this direction. The French language being his native tongue, Prof. Paquin was able to avail himself of the advantages offered him to an unusual degree, and his six years' experience as an original investigator and instructor in these subjects, has eminently qualified him for the important work which he has undertaken.

The five departments of the laboratory necessarily involve much work, and imply that special talent must be engaged in it, and furthermore, that many investigations must be slow and costly. The Institution has looked into all that, and realizes the great responsibility involved without any direct restitution of its expenditure; but this should not deter, as the task is undertaken for no other purpose than the good of the human race, and no matter how slow and costly, we shall publish no report in haste, for the vainglory of the investigators or the promoters; we shall give each question studied due consideration, and announce progress or definite results from time to time, in these columns, as may be deemed wise. Therefore, we do not expect at once to enter the arena of science with results of great magnitude in all the departments of our laboratory; but we do hope to present continually some valuable scientific and practical facts in various lines of research.

The questions now being studied in the departments are as follows: —

Purity and impurities in vaccinia of commerce (bovine vaccine).

Tests of a new kind of drainage tube (improvised by the superintendent).

The kind, and action of fruit microorganisms in digestion.

The cause of pus production in using catgut ligature.

Typhoid fever, and its modes of dissemination.

The relative toxicity of microbic products on different culture media.

The relative toxicity of urines under different dietetics.

In the *Vaccine Department*, a limited quantity of very pure, active, and safe vaccinia is produced during our investigations, and supplied to the physicians who may wish to try a thoroughly reliable article. We have not opened a commercial establishment, with agents in various parts of the country; but we will on request, mail, pure, fresh vaccine points at $1 per package of ten. Already we have orders for such specimens from even remote parts of the United States, and from Mexico. We feel confident that the aseptic methods employed to produce the vaccine in a perfectly new and purposely modeled building, will lead to a great improvement over the ordinary ways of most commercial establishments, and remove the objections often advanced against this mode of protection against smallpox.

J. H. K.

STAINING THE BACILLUS TUBERCULOSIS.

The following is the method of Pittion and Roux for differential staining of bacillus tuberculosis.

Make three solutions as follows: —

Solution A: Ten parts of fuchsin dissolved in 100 parts of absolute alcohol.

Solution B: Three parts of liquid ammonia in 100 parts of distilled water.

Solution C: Alcohol 50 parts, water 30 parts, nitric acid (con.) 15 parts, aniline green to saturation. In making this solution, dissolve the green in the alcohol, and

[1] This is not the case in most commercial institutions.

[2] An illustrated report of close investigations on vaccine and vaccination, will appear in December number.

add the water, and lastly the acid. This solution will not keep long, and must be made fresh each time.

To use: To ten parts of solution B add one part of solution A, and heat until vapor begins to make its appearance. Now float the cover glass prepared in the ordinary way, film down, for two or three minutes (while you mix solution C). Remove the cover glass with platinum forceps, and wash thoroughly with distilled water, then let fall a few drops of solution C on the film side, and wash again, continuing the operation of washing and decolorizing until the red color is replaced by a tinge of green; then give a final washing, dry, and mount in balsam.

The mount under the microscope should show the bacilli stained a beautiful rose red, on a delicate green background.

It is well for the beginner to make solution C weaker in acid, so that the decolorizing will be slower and can be better watched.

If solution B is too strong in ammonia, it will precipitate the fuchsin.

It will be noticed that recommendation is made to prepare solution C, each time, fresh, because it does not keep long. This is a drawback in using this staining method. I have found that this precaution is unnecessary, however, as the solution acts just as well when it is yellow with age and in a state of decomposition, as it were, as it does fresh. If one uses solution C in this condition, it will be found that in washing, the water instantly brings back the green color, and the background of the preparation is always stained a beautiful green. If anything, the old solution is better. So the whole process may be much simplified by making the three solutions at once, to be used when necessary. P. P.

Lotion in Diphtheria. — P. Kastenko and F. Grabovoski found that corrosive sublimate 1–5,000, alcohol 85 per cent, phenic acid 2 per cent, destroyed the diphtheria bacillus on agar culture in one minute.

TECHNIQUE.

How to Prepare Hydrogen Peroxide. — A French chemical journal gives the following as a simple method of preparing a solution of pure hydrogen peroxide. Mix barium peroxide with water to the consistency of thin milk. Decompose the peroxide by the addition of HCL, specific gravity 1.100. Add to the mixture one fourth its volume of ether, and shake well. The ether dissolves one part of the hydrogen peroxide. Turn off the ether, and shake with twice the volume of pure water. The water will take up a great part of the peroxide. Separate the ether, and add to a fresh barium peroxide solution. After shaking, decant the ether, and mix with the same proportion of water several times. By repeating the operation the water may be made to take up more of the hydrogen peroxide, till it contains from 5 to 9 per cent of this valuable disinfecting agent. A small amount of ether in the solution will aid in its preservation. When it can be obtained, it is far cheaper to purchase the peroxide of hydrogen from some reliable manufacturer, as The Drevet Mfg. Co., of New York, but in an emergency the method suggested might prove valuable.

Creosote in Consumption. — Dujardin-Beaumetz, and numerous other French physicians, give pure Beechwood creosote pre-eminence as a remedy for pulmonary tuberculosis. Three methods of administration are employed: By the mouth, in pills or capsules; hypodermically, dissolved in fluid vaseline or oil of sweet almonds carefully sterilized; and by the rectum, either in the form of suppositories or an emulsion. The last method gives the patient the least inconvenience, and has the advantage of producing no disturbance of digestion. We have made use of this remedy for some months, and have seen in a number of instances very

appreciable improvement. We have also found it useful in cases of chronic diarrhea. The following formula is a convenient one: —

Pure Beechwood creosote, from 20 to 60 minims.
Oil sweet almonds, 3 oz.
Yolk of one egg.
Water, 60 oz.

Dissolve the creosote in the oil, add the yolk of the egg, and shake until well mixed, then add the water. Administer just before going to bed, after emptying the bowels by an enema of warm water.

We have been surprised to note the tolerance of both the rectal membrane and the general system to this remedy. We have administered it in doses varying from 15 to 60 minims, by this method, and have never seen the slightest unpleasant result in consequence. Care must, of course, be taken to avoid the use of this remedy in cases of renal insufficiency.

Test for Creosote in the Urine. — The following method is employed by M. Kügler: Shake the urine with ether, separate the ether, evaporate, add water to the residue, and decant the water from the insoluble deposit. This solution of creosote throws down a reddish-brown resinous precipitate with bromine, and gives a greenish-blue color, with a trace of perchloride of iron.

Micro-Spectroscopic Examination of the Blood. — M. Hennocque, who has, perhaps, made more extended spectroscopic studies of the blood than any other pathologist, has recently perfected a new form of hæmatoscope, by means of which he is able to measure with great exactness the amount of oxyhæmoglobin in the blood, when the quantity contained is greater than .000,000,81.

Nummular matters in sputum should be treated with a 2 per cent solution of caustic potash before staining for bacilli.

Notices.

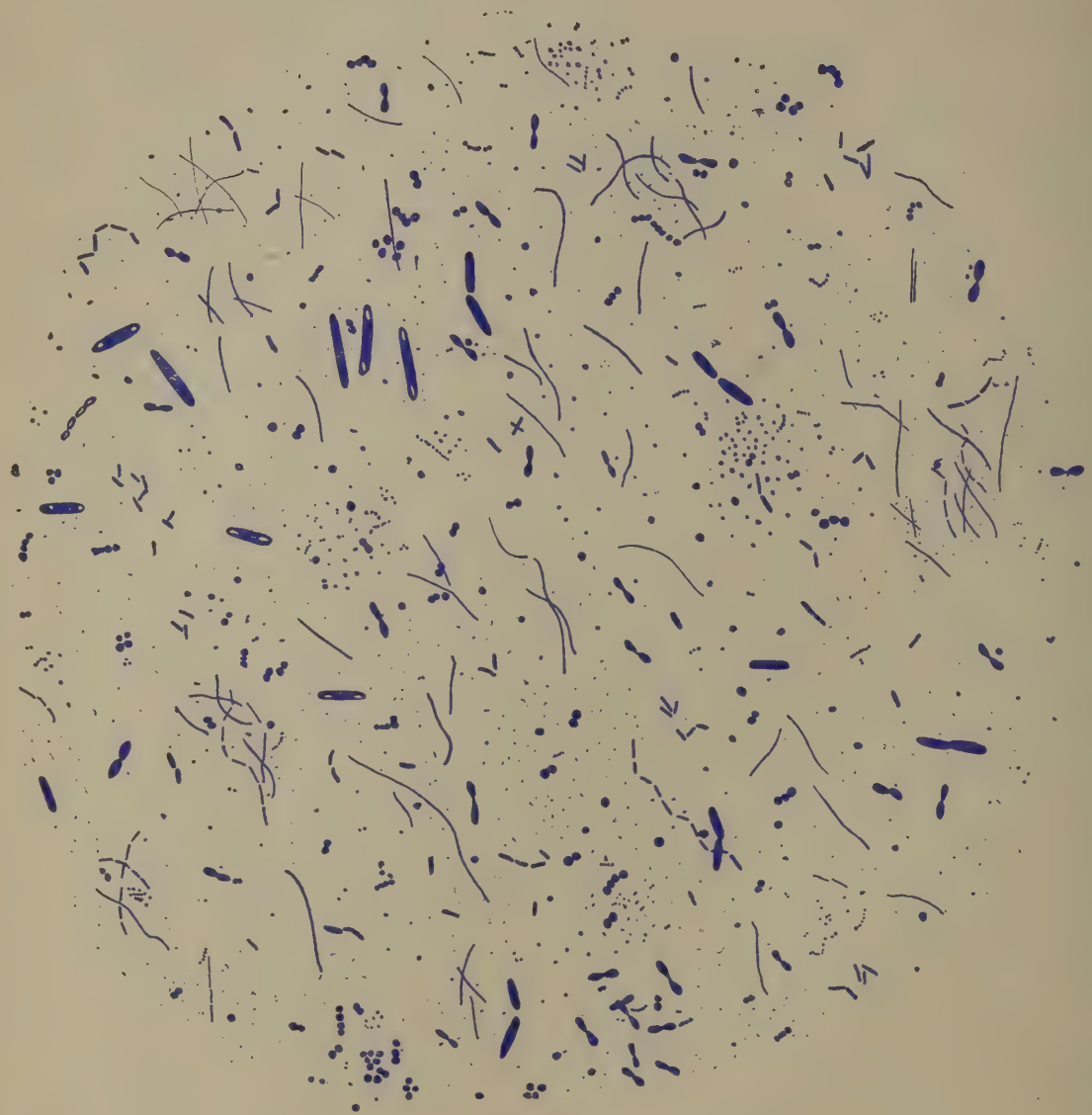
[Literary]

The Arena for December contains a frontispiece of J. G. Whittier, and articles as follows: "New Discoveries in the Heavens," by Camille Flammarion; "Protection or Free Trade — Which?" by Hon David A. Wills; "Whittier, the N. E. Poet," by Geo. Stewart; "Faith in God as a Personal Equation," by Rev. C. A. Bartol; "Association in Clubs with its Bearings on Working-Women," and "In the Meshes of a Terrible Spell," by Helen Campbell; "Citizenship and Suffrage," by Francis Minor; "The Logic of Port Royal and Modern Science," by Prof. T. Funck Brentano; "Qualification of the Elective Franchise," by R. H. Williams; "Uncle Ripley's Speculation," by Hamlin Garland; editorials, book notices, etc. Arena Pub. Co., Boston, Mass. $5 per year.

[Commercial.]

Queen and Co., Opticians, etc., moved to 1010 Chestnut street, Philadelphia. This great house, with its numerous and varied branches of business as manufacturers and dealers in optical, chemical, engineering, photographic, meteorological apparatus, had been looking for more convenient quarters for some time, and have at last found a location more suitable to their diverse departments.

Department No. 3, of special interest to our readers, is for microscopes and all instruments which are allied to the microscope. They include microscopic objectives and accessories, mounting materials, microscopic objects (including histological and pathological specimens), works upon microscopy, polarizing apparatus, reading glasses, hand magnifiers for botanists and others, graphoscopes, stereoscopes and views, etc., etc. From this department comes the *Microscopical Bulletin*, a journal ably conducted by the manager, who is an enthusiast upon the subject. No other publication upon microscopy has so large a circle of readers.



Various microbes from a mixture of two different cultures, 36 hours old, from commercial vaccine points of a same crop. A drop of each of the liquid cultures were mixed and diluted with distilled sterile water, and spread very evenly on cover glass before mounting.

(See article on Vaccine in this number.)

PLATE III.

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., DECEMBER, 1891. NO. 2.

ORIGINAL ARTICLES.

INFLUENCE OF THE CONTINUOUS CURRENT ON MICROBES, PARTICULARLY ON CHARBON BACTERIDIA.

BY M. N. APOSTOLI AND LAGUERRIERE, OF PARIS.

(Continued.)

Fourteenth Series (June 16, 1889), Charbon. Tubes No. 2.

A current of 250 milliamperes, 9 minutes on broth of charbon culture, only attenuated the virulence; two rabbits inoculated before the experiment, died in the night of June 17 to 18; four rabbits inoculated after the operation, died also, but about seventy-two hours after the first.

Fifteenth Series (June 25, 1889), Charbon.

Four guinea-pigs, having been inoculated with culture attenuated by the current, and having survived, were inoculated with virulent anthrax, and died in three or four days. They had retained all, or nearly all, their receptivity for charbon.

Sixteenth Series (June 25, 1889), Charbon. Tubes No. 2.

1. A current of 500 milliamperes, 3 minutes, then of 400 during the 4th minute, and of 350 during the 5th minute, destroyed all virulence; two guinea-pigs inoculated before the experiment, succumbed; four guinea-pigs inoculated after the experiment, remained indifferent.

2. A current varying from 500 to 250 milliamperes, applied 10 minutes on another tube of the same culture, modified that culture, and the inoculation of four guinea-pigs therewith remained negative.

Seventeenth Series (June 29, 1889), Charbon. Tubes No. 2.

A current of 250 milliamperes, 10 minutes, modified the cultures of charbon broth; two guinea-pigs inoculated before the operation, died in about thirty-six hours, while six guinea-pigs inoculated after the experiment, remained unaffected.

Eighteenth Series (July 3, 1889), Charbon. Tubes No. 2.

A current varying from 150 to 220 milliamperes applied for 15 minutes, caused the temperature of the tube to rise to 90°; two guinea-pigs inoculated before the operation died in about forty-eight hours; five guinea-pigs inoculated after the operation, survived.

Nineteenth Series (July 9, 1889), Charbon. Tubes No. 2.

1. A current of from 210 to 260 milliamperes, 5 minutes, raised the temperature of the culture to 48°; two guinea-pigs inoculated before the operation, succumbed in seventy-two hours; three guinea-pigs inoculated after the operation, survived.

2. A current of 500 milliamperes, reduced progressively to 170 milliamperes at the 5th minute, applied 5 minutes, raised the temperature to 95° centigrade; two guinea-pigs inoculated before, died; three guinea-pigs inoculated afterward, survived.

In these experiments, the sowing done with cultures tested by the passage of the current, remained sterile.

Twentieth Series (July 11, 1889), Charbon. Tubes No. 2.

1. A current of from 130 to 180 milliamperes attenuated a charbon culture. Temperature ranged from 32° to 48° centigrade in 5 minutes. Two guinea-pigs inoculated before the experiment, died in forty-eight hours; the three guinea-pigs inoculated after the experiment, survived.

2. A current decreasing from 130 to 30 milliamperes, applied during 30 consecutive minutes, and having produced a maximum temperature of 60°, attenuated the virulence; three guinea-pigs inoculated, died twenty hours after the witness guinea-pigs.

Twenty-first Series (July 14, 1889), Charbon. Tubes No. 2.

A current of from 220 to 500 milliamperes, applied 5 minutes, caused the culture to raise to 99° centigrade, and killed the microbes: two guinea-pigs inoculated before, died in forty-eight hours; three guinea-pigs inoculated afterward, lived.

Twenty-second Series (July 14, 1889), Charbon. Tubes No. 2.

1. A constant current of 200 milliamperes, applied 5 minutes, raised the temperature of the tube from 26° to 54° C. The same culture as that of July 14. Of five guinea-pigs inoculated, two died the fourth day; the others lived.

2. A current of the same intensity is applied 10 minutes to another culture of the same age. During the experiment the temperature rose from 26° to 83° C. Five guinea-pigs were then inoculated, three of which died respectively the 21st, 22nd, and 23rd of July.

N. B.—These two experiments are incomplete, no guinea-pigs having been previously inoculated.

Twenty-third Series (July 21, 1889), Charbon. Tubes No. 2.

1. Two guinea-pigs were inoculated with the same culture as the preceding experiments, that is to say, with a culture ten days old. One of the guinea-pigs died in the night of the 24th to the 25th; the other lived.

2. The virulent liquid was then attenuated by 150 milliamperes in 5 minutes; temperature raised to from 30° to 59° C.; three inoculated guinea-pigs survived.

3. The same virus, attenuated at 100 milliamperes in 5 minutes, 31° to 41° centigrade, gave a negative result from the inoculation of guinea-pigs.

N. B.—These experiments have their value; but the destruction of the virulence with a feeble intensity, is owing to the fact that that virulence had already been naturally attenuated by age.

Twenty-fourth Series (July 23, 1889), Charbon.

A guinea-pig inoculated July 4, with charbon broth attenuated at 160 milliamperes, 3 minutes, re-inoculated without success June 25; then July 14, with virulent broth, was inoculated for the fourth time July 23, with a c.c. of virulent broth, and died of charbon, July 27.

This is the only guinea-pig which, in the course of our experiments, appeared to have acquired a certain immunity. Of all the other guinea-pigs which were inoculated with charbon broth, more or less attenuated, some succumbed rapidly to the effects of a virulent inoculation, others succumbed only in four or five days, that is to say, more slowly than the witnesses inoculated with the same virus.

Twenty-fifth Series (July 26, 1889), Charbon. Tubes No. 2.

1. Eight guinea-pigs, virgins as to inoculation, were inoculated without success, with tubes of charbon broth previously sterilized.

Twenty-sixth Series (July 30, 1889), Charbon. Tubes No. 2.

Experiments made in the presence of M. Bouchard and M. Charrin.

1. Three guinea-pigs inoculated with virus of twenty-four hours, of the Pasteur Institute, received five divisions of the Strauss syringe, and succumbed in less than forty-eight hours.

2. Nine guinea-pigs were inoculated with attenuated tubes, and five divisions of the syringe.

(*a.*) Three guinea-pigs were inoculated with a tube placed in ice[1] and subjected tc a current of from 100 to 110 milliamperes, 15 minutes. One of the guinea-pigs, twice inoculated (the syringe performed badly), died August 4; the other two lived. In this experiment, the initial temperature was 6°; at the 15th minute, it was 37½°.

(*b.*) Three guinea-pigs inoculated with virus attenuated during 15 minutes, 80 to 150 milliamperes, temperature from 26° to 33°, lived.

(*c.*) Three guinea-pigs inoculated with virus attenuated during 6 minutes, by current from 85 to 115 milliamperes, lived. The temperature of the liquid had been raised from 25½° to 45°. In the experiments *b* and *c*, the tubes used were not placed in ice.

These eight guinea-pigs were inoculated August 17 by Charrin, with virulent charbon, and succumbed.

N. B.—In this experiment, we are not absolutely sure of the intensity; two galvanometers, one of which was *Shunté*, had been intercalated in the circuit. These galvanometers have given scattering results, and we have thought it proper to give the average of the two different mensurations.

Twenty-seventh Series (*July 31, 1889*), *Charbon.*

Experiment with virus the second day of sowing: Ten guinea-pigs were inoculated and died of charbon. These animals had been previously inoculated with liquid, the virulence of which had been attenuated or destroyed by currents, the intensity of which had varied, in the different tubes, from 180 to 500 milliamperes.

In guinea-pigs inoculated with tubes that had had the maximum intensity, death occurred in less than 48 hours. With the other, death occurred near the fourth day.

Twenty-eighth Series (*Oct. 15, 1889*), *Charbon.*

1. Two guinea-pigs that had already been twice inoculated with attenuated virus, received two drops of virulent virus (fifth day of sowing); one died only the fifth day, the other survived, but was killed by a new virulent inoculation, October 29.

2. Five guinea-pigs inoculated with two drops of the same virus, subjected to an average current of 200 milliamperes, 5 minutes, survived.

Twenty-ninth Series (*Oct. 19, 1889*), *Charbon.*

1. Two guinea-pigs, virgin as to inoculation, were inoculated with two drops of virulent virus, the same as used in the previous experiment. One died the fourth day, the other, the fifth.

2. With the same virus attenuated at the previous meeting, two guinea-pigs, virgin as to inoculation, were inoculated with two drops, and lived.

3. Eight other guinea-pigs that had previously been inoculated with attenuated virus, were inoculated without success with two drops of virus attenuated at the preceding experiment.

Thirtieth Series (*Oct. 22, 1889*), *Charbon.*

Five drops of culture of October 9 were used without results in inoculating two guinea-pigs, virgin as to inoculation. This culture having been left in the laboratory room, had naturally lost its virulent quality.

Thirty-first Series (*Oct. 26, 1889*), *Charbon.*

1. With culture of twenty-four hours placed in the drying room at 25°, two guinea-pigs were inoculated. One received two drops and died in less than forty-eight hours; the other received only one drop and died only the fourth day.

2. The culture was attenuated by a constant current of 130 milliamperes, 5 minutes. Fourteen guinea-pigs were inoculated with eight drops of this attenuated virus. Three of them died in about seventy-two hours. The others lived.

Thirty-second Series (*Nov. 16, 1889*), *Charbon.*

Nine guinea-pigs, eight of which having already been inoculated with virus more or less attenuated by the galvanic current, were inoculated with two drops of viru-

[1] It was the second time in the course of our experiments that the tubes had been placed in ice to eliminate the thermal influence.

lent culture received from the Pasteur Institute, November 3. Seven of the old guinea-pigs died. The guinea-pig that had not been inoculated, and the old guinea-pig lived.[1]

Thirty-third Series (Nov. 24, 1889), Charbon. Tubes No. 3.

This was the first time we used apparatus No. 3, which clearly separates the poles, and in which the liquids that gather around each of them, take and keep in a distinct manner the opposite reactions.

1. Four drops of a virus slightly virulent were inoculated into two guinea-pigs without result.

2. A current of from 80 to 70 milliamperes is then applied on the culture for 30 minutes.

(Communicating tubes placed in ice.)

Four drops from the positive tube killed two guinea-pigs; one died the third day, the other, the fourth.

Four drops from the negative tube killed one guinea-pig out of two, the fourth day.

Four drops from the central positive tube or from the central negative tube, produced nothing on four guinea-pigs.

N. B.— There was then revivification of the virus, especially at the positive pole.

Thirty-fourth Series (Dec. 4, 1889), Charbon. Tubes No. 3.

1. Two witness-rabbits were inoculated with five divisions of virulent culture received from the Pasteur Institute. The rabbits died the morning of December 8.

2. Two guinea-pigs previously inoculated with attenuated virus, received five divisions of the same culture. One died December 9, the other survived.

The apparatus — tube No. 3 — is placed in pounded ice. Before the passage of the current, thermometers placed in the different tubes registered the following temperatures:—

Positive tube, 3° C.; negative tube, 2°; central tube, 2°. At the end of ten minutes of a constant current of 200 milliamperes, the elevation of the temperature was the same for the different tubes; 2 degrees for the negative tube and for the intermediary tubes, 2½ for the positive tube.

Of six rabbits which were inoculated, two for each pole and two for the interpolary circuit, the two rabbits of the positive tube were the only ones that resisted; the four others died in the night of December 7 to 8; that is to say, in the same time that the witness-rabbits died.

3. As in most experiments with apparatus No. 3, tubes of peptonized broth were supplied, or sown with removals made, after the passage of the current on the positive tube, on the negative, and in the tubes of the interpolary circuit. Only the sowing done with the positive tube remained sterile. On the other hand, sowing done with the cultures of the interpolary circuit or with that of the negative tube, gave a positive result. Howbeit, the degree of virulence of those cultures has not yet been studied.

N. B.— In this experiment, as well as in all others made with apparatus No. 3 the gases produced by electrolysis escaped at the upper extremity of the positive and negative tubes: the two central tubes of the interpolary circuit were sheltered against all gaseous mixtures.

Thirty-fifth Series (Jan. 31, 1890), Charbon.

One of the two rabbits inoculated December 4, with attenuated culture of the positive tube, was inoculated with four drops of virulent charbon. The rabbit died in the night of February 2 to 3.

Thirty-sixth Series (Feb. 4, 1890), Charbon. Tubes No. 3.

With tubes of broth and of peptonized gelatine sown since forty-eight hours in full bacteridian vegetation, two rabbits were inoculated and remained refractory.

On apparatus No. 3, placed in ice, a feeble current of from 90 to 95 milliamperes is applied for 10 minutes. Inocu-

[1] To give a striking and convincing result, it is necessary to use virulent culture of from twenty-four to thirty-six hours old. Outside of this, the virus is modified, and the results become uncertain.

lated rabbits with different tubes remained refractory, as the witness-rabbits had been.

The sowing done with the negative and interpolary tubes vegetated absolutely like the sowing done before the experiment.

The sowing done with the positive tube commenced to produce its effect the fourth day.

N. B. — In these experiments, the virus sown and used for inoculation was not sufficiently virulent to kill rabbits.

However, the sowing by means of the positive tube demonstrated that the virulence of the positive tube, or at least its vegetation, modified itself relatively to that of the other tubes.

Thirty-seventh Series (Feb. 6, 1890), Charbon.

Three guinea-pigs inoculated with cultures of the positive, central, and negative tubes of the preceding experiments, remained refractory.

The virus must therefore have been of a greatly weakened virulence. It still vegetated in media of culture, but it did not kill even the guinea-pig.

(To be continued.)

"GRIPPE" AND PHTHISIS.

BY JOSEPH WILLIAM STICKLER, M. D.,
Pathologist to Memorial Hospital, Orange, N. J.

Dr. V. M. Gayle, of Kansas City, Mo,. says: "Epidemic influenza, if not properly treated, is more liable to serious, complications than almost any other disease we know of." I think he is correct. Even when well treated, it is apt to be accompanied with distressing lesions of one sort or another, and not infrequently it is followed by pulmonary phthisis. This is the point to which I call your attention.

Not long ago I was called to see a patient sixty-five years old, a Scotchman, with a good family history — no phthisis on either father's or mother's side. He had never had a pulmonary lesion till attacked by "La Grippe" one year ago last Christmas. The attack lasted about three weeks, and left him with a cough. The cough continued, and expectoration was moderate. The patient's general condition suffered very manifestly. He lost in both weight and strength. In July, 1890, he had quite a profuse hemorrhage, which prostrated him perceptibly. He then began to expectorate more profusely, and coughed almost constantly. Boils developed about the trunk, and a perineal abscess made its appearance. His appetite became seriously impaired, and emaciation progressed rapidly. He soon became confined to his home, and a little later to his bed. When I first saw him, a few days ago, he could scarcely walk, was very thin, coughed hard and often, and expectorated freely. Physical examination revealed a cavity at the apex of each lung, consolidation of the entire left lung, except the lower portion of the lower lobe, and consolidation of the upper lobe of the right lung, except that portion of it in which the cavity existed.

This man will die. He will be killed by pulmonary phthisis. All his trouble dates back to the "Grippe." Had he not had "La Grippe," phthisis would not have developed. Possibly he might have escaped the pulmonary lesion had he gone at once to a more healthful climate, say, Denver, Col., or Ashville, N. C.; but the fact stands that he will soon leave his family and friends, because the "Grippe" started in his lungs a fatal phthisical process.

A few months since, I was asked to go to Bethel, Conn., to see a young man ill with phthisis. When I questioned him, I learned that he had had an attack of "Grippe" about a year ago. He thought he had made a good recovery, but it was not long before he began to cough and expectorate, and after a little time had elapsed, he presented all the symptoms of pulmonary phthisis. When I saw him, he had cavities, large and small, in both lungs, was coughing almost constantly, expectorated profusely, had night-sweats, was emaciated to the point of looking like a skeleton, had laryngeal tubercular ulcers, and scarcely strength enough left

to make it possible for him to stand up without support. About two months later he died.

I might mention other cases, but will not do so, as the point to which I would call your attention is apparent.

To prevent the occurrence of such physical disaster, watch every "Grippe" patient *very* carefully. Frequently examine the lungs, and as soon as you discover evidence of the existence of phthisis, acquaint the family (sometimes the patient) with the fact, and adopt such a course of treatment as will be calculated to save the patient's life.

My own opinion is to the effect that the climatic treatment (with such supplementary help as may be wise) is the best, and should be recommended at an early date.

THE INFLUENCE OF DRESS IN PRODUCING THE PHYSICAL DECADENCE OF AMERICAN WOMEN.

J. H. KELLOGG, M. D., BATTLE CREEK.

(Continued.)

THE question may arise, whether we are treating the subject fairly, in charging upon errors in dress, so great and so serious modifications of the human form as we have pointed out, and whether it is not possible that visceral displacements in some of those cases to which I have called attention, are to be found in men as well as in women. In order to place this subject upon a rational basis, I recently made a careful examination respecting the position of the stomach, liver, and bowels in 50 working men and 71 working women, all of whom were in ordinary health.

Of the 71 women examined, prolapsus of the stomach and bowels was found in 56 cases. In 19 of these cases, the right kidney was found prolapsed, and in one case, both kidneys. The 15 cases in which the stomach and bowels were not prolapsed were all persons under 24 years of age. None of these had ever laced tightly, and four had never worn corsets or tight waistbands, having always worn clothing suspended from the shoulders. It is noticeable that in a number of cases in which corsets had never been worn, tight waistbands had produced very extensive displacement of the stomach, bowels, and kidney. In one of these the liver was displaced downward.

In the 50 men, I found only six in whom the stomach and bowels could be said to be prolapsed. In one the right kidney was prolapsed. In only three was the degree of prolapse anything at all comparable with that observed in the women, and in these three (and in one other of these six cases, making four in all) it was found on inquiry that a belt or something equivalent had been worn in three cases, as a means of sustaining the pantaloons. In one case the patient attributed his condition to the wearing of a truss furnished with a belt drawn tightly about the waist. This belt had been worn a sufficiently long time to be an ample cause for the visceral displacement observed. In the two cases of slight visceral prolapse in which belts had been worn, there was considerable deformity of the figure due to general weakness, and a habitual standing with the weight upon one foot. By comparison, we see the relative frequency of visceral prolapse in the men and women examined, was 12 per cent of the men and 80 per cent of the women. In other words, visceral prolapse was found to be 6⅔ times as frequent in women as in men. It is also noticeable that, with the exception of two cases of visceral prolapse in the men, the visceral prolapse in the men was due to the same cause which caused visceral prolapse in women: viz., constriction of the waist. It makes no difference, of course, whether the constriction is applied by means of a corset or a waistband or a belt.

I have met a number of cases of visceral prolapse in men in which the disease was directly traceable to the wearing of a belt. One case was that of a military officer, who wore a tight sword-belt, in which he

carried almost constantly a heavy sword. I have also made some observations of the same character among blacksmiths, who have a habit of sustaining their pantaloons by means of the strings of their leather aprons tied tightly about the waist, the suspenders being loosened so as to give greater freedom to the movements of the arms. Farmers, also, sometimes seek to liberate their shoulders by wearing the suspenders tied about the waist. Leaving out of consideration the four cases of men in whom the visceral displacement was due to the same causes which produce this morbid condition in women, we find but two cases in which the viscera had become displaced from other causes, or one in twenty-five, — a frequency just one twentieth of that in which this diseased condition is found in women who consider themselves enjoying ordinary health.

These facts, it seems to me, are amply sufficient to establish my proposition,— that constriction of the waist is the cause of downward displacement of the pelvic viscera, and of the diseases which naturally grow out of such disturbances of the static relations of the organs occupying this portion of the trunk.

The injury inflicted upon the body at its central portion by constriction of the waist, attacks the very citadel of its strength and vigor, the stomach and its associate organs constituting the headquarters for the supply of force and energy for the whole system. It is doubtless for this reason that the great abdominal brain, the largest collection of nerve matter in the sympathetic system, is found in such close relation to the stomach. Lying, as it does, exactly in the plane of the waist, any abnormal pressure at this point must act directly upon this great center of reflex nervous activity.

By the inactivity of the muscles of the trunk, and the failure of development due to continued pressure, the muscles of the central and anterior portions of the trunk become abnormally weak, so that their natural tone is insufficient to support the abdominal contents in their normal position. As I have already shown, an additional injury results from the failure of these weakened muscles to perform their duty as guys, which balance the upper half of the pelvis upon the trunk, and by their efficient action in health, maintain a graceful and healthful poise of the body.

The strong and beautiful curves which are observed in a spirited horse are not only attractive from an æsthetic point of view, but are also of the highest significance from a physiological standpoint. In the healthy, vigorous animal, one observes that the head is held high, the neck and back strongly curved, the limbs firmly set, and the whole expression indicates vigor and strength. The same is equally true of the human body. An erect head, well curved back, prominent chest, retracted abdomen, and firmly set limbs, are indicative of an energized carriage of the body which is characteristic of health. The flat chest, posterior dorsal curve, projecting chin, protruding abdomen, are equally indicative of a relaxed and weak carriage of the body, characteristic of feebleness and disease. The spiritless and tired horse does not *hold* his head down; he lacks the vigor and disposition *to hold it up*. So the woman who has been accustomed to the support of stays of steel or bone, finds herself, when without these means of support, feeling, as she says, "as though she would fall to pieces." The muscles of the waist lack the ability to balance the chest and shoulders upon the hips.

As I shall show you presently, in the outlines which will be thrown upon the screen, that the direct effect of the corset, and of any constriction of the waist, is to break down the natural curves of the back, straightening the spine, thus depressing the chest, and causing the shoulders to fall forward, and producing general collapse of the front wall of the trunk.

In consequence of the weakening of the muscles which support the trunk, and especially weakness of the waist muscles, an ungraceful and unnatural carriage of

the body appears, not only in walking and standing, but in sitting. The weak waisted woman is comfortable only when sitting in a rocking or easy chair. She cannot be comfortable unless the back is supported; consequently, in sitting, the muscles of the trunk are completely relaxed, thus causing collapse of the waist and protrusion of the lower abdomen by the depression at the waist occasioned by the depression of the ribs.

Such persons, in standing, assume a great variety of awkward and unhealthful positions, some of the most common of which will be shown presently upon the screen. The most common faults are dropping the shoulders, projecting the chin, hips too far forward, weight resting upon the heels or upon one foot, and a general lack of even and graceful balance of the body. In walking, the forward position of the hips makes it impossible to plant the whole sole of the foot down at once and firmly, so the weight is thrust continually upon the heels. This difficulty is increased by wearing high-heeled shoes. A swinging, swaying, wriggling, or otherwise awkward gait, is the most common mode of walking one sees in women, very few of whom are good walkers, in consequence of the inability to balance the body, through the weakness of the muscles of the waist.

The fourth charge which I have made against the common mode of dress, in which the waist is constricted, is that it induces and necessitates an abnormal mode of respiration.

In normal breathing, the shape of the chest-cavity is changed in the act of inspiration in such a manner that its diameter is increased in all directions. The greatest increase, however, is in its longitudinal diameter, due to flattening of the diaphragm; and in the lateral transverse diameter of the lower part of the chest, due to the action of the inspiratory muscles, and, according to Brüger, also in part due to the depression of the abdominal viscera by the contracting diaphragm. In normal respiration in children of both sexes, and in both men and women of savage tribes, in whom the dress of the two sexes is practically alike, the chief movements noticeable to the eye in inspiration are widening of the chest at its lower part and bulging of the abdominal wall. There is at the same time a rhythmical action of the muscles of the pelvic floor, induced by the increase of abdominal pressure resulting from the flattening of the diaphragm acting against the resistance of the tense abdominal muscles.

That the respiratory movements are practically alike in adult persons of the two sexes, I think has been fully established by the observations of Mays, Dickinson, and others, as well as by my own studies upon Indian women of various tribes, Chinese women, Italian peasant women, and American women whose breathing has never been interfered with by tight-fitting clothing.

The relation of corsets and tight bands to respiration has usually been studied with reference to their influence upon the lungs or the respiratory process. The important relation of the respiratory process to the abdominal and pelvic viscera has too often been overlooked, although the disturbance of the normal relation existing between respiration, and the circulation of the blood in the abdominal and pelvic viscera, is undoubtedly a matter of far greater importance than any interference with the respiratory process occasioned by constriction of the waist.

When the waist is constricted, both elements of the respiratory process through which the abdominal pelvic circulation is assisted, are seriously weakened. The increase of the abdominal tension, resulting from the pressure of the diaphragm, is prevented by the fact that the transverse diameter of the lower portion of the chest is not only diminished, but fixed. The lateral attachments of the diaphragm are thus approached in such a manner that this muscle is rendered incapable of efficient contraction. At the same time, the intra-thoracic negative pressure is dimin-

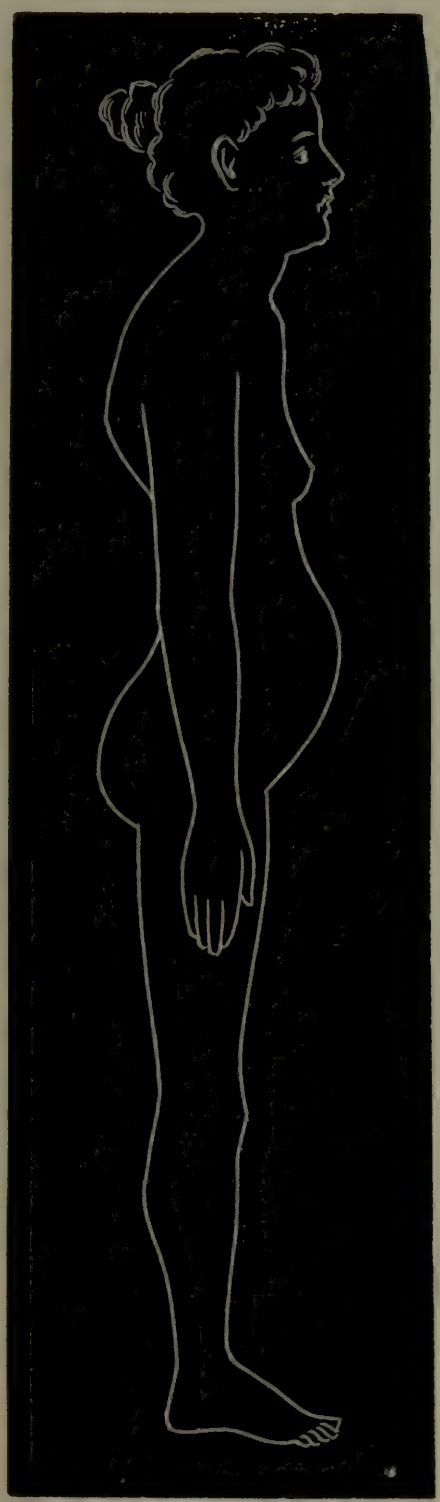


FIG. 1. Effects of tight lacing, and neglect of physical exercise.

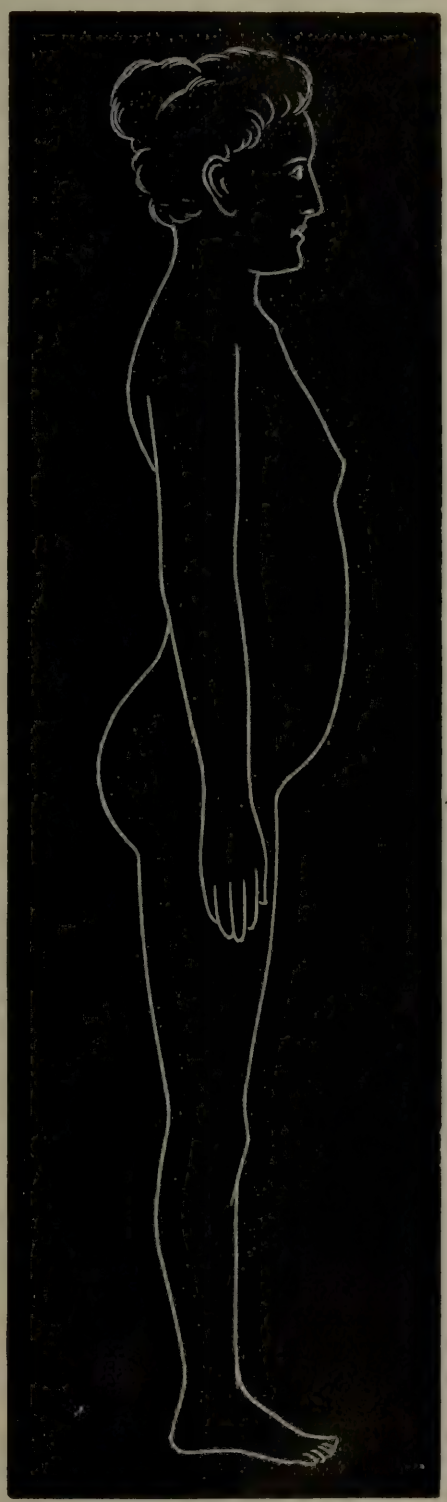


FIG. 2. The same person after a few months' training.

PROFILE TRACINGS SHOWING CORRECT AND INCORRECT STANDING POSITIONS.

ished through the crippling of the inspiratory act. The lower portion of the chest being held firmly, any increase in the transverse diameter of this part is impossible. The normal descent of the diaphragm being prevented, the longitudinal diameter of the chest cannot be increased to the proper extent. The chest is left free to act only in its upper part, the elasticity of which is much less than that of the lower portion, in consequence of the rigid character of the ribs, and the shortness of the cartilages which connect the ribs to the sternum, as well as the comparative weakness of the muscles which act upon this portion of the chest.

The crippled condition of respiration in a woman whose waist is constricted by a corset or tight bands, is clearly shown by the readiness with which such a woman gets out of breath when called upon to make unusual exertion, or when there is a special demand for lung activity from any other cause. The first thing done for a fainting woman is to cut her waistbands and corset strings; but no one would ever think of tearing open a man's vest or slitting up his shirt front under the same circumstances.

EXPLANATION OF PLATE.

FIGURE 1. Side-view outline of a woman of twenty-four years, who was suffering from nervous dyspepsia and prolapsus of uterus and ovaries.

FIG. 2. This outline represents the same young woman after a few months' physical training. She was restored to excellent health, and has since been able to engage regularly in the profession of nursing.

For Cracked Nipples. — Dr. F. Van Allen recommends bathing the parts with ordinary white of egg, after carefully cleansing. The application should be made after each nursing. Before the child nurses, the parts should be moistened with a little water. The white of egg, after being applied, should be allowed to dry before the parts are covered.

A NEW HYDROPATHIC TREATMENT FOR DYSPEPSIA.

BY PROF. WM. WINTERNITZ, M. D., OF VIENNA.

[This article was prepared by Prof. Winternitz expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE several months ago, but a press of other matter has delayed its publication until the present time. This explanation is given on account of the fact that a translation from the German of a description of the same treatment, has recently appeared in an American medical journal.— EDS.]

THOSE suffering from disorders of the stomach furnish a proportionately not very large contingent of the various materials of disease which annually come under my notice. According to statistics which have for twenty-five years been accurately kept, only 11.6 per cent of all the patients that come to my water-cure at Keltenlentgeben for treatment, suffer from troubles of the stomach or the intestines; and if we consider that according to the same statistics 56 per cent of these have been healed, and some what over 40 per cent were helped,— some more, some less, either permanently, or lasting some little while, — while only 4 per cent were treated without any marked results for the better whatever, it must surely be conceded that hydropathic and dietetic treatments must be counted among the most efficient helps in healing these forms of disease.

There are among my patients numerous cases who have already undergone the mose diversified cures, partly with some passing relief, partly without any at all, quite a goodly proportion of whom have finally been healed here.

Aside from the general remedies which affect the entire surface of the body, hydropathic stomach-cures, particularly sitz-baths, under various degrees of temperature, and cooling, or heating and stimulating compresses, or packs around the body, are decidedly to be preferred.

To-day I shall not enter into the general working-effects of hydropathic stimulation on the entire surface of the body, or how water-treatment accidentally affects the digestive processes; nor shall I

stop to consider the known modes of heightening the appetency for more rapid and complete digestive action, which fact has led me, by means of direct investigation in that direction, to discover a surer foundation for it, as I will soon develop; neither shall I stop to deplore the fact that in general the effects of thermic influences, as brought to bear upon the surface of the body, are undervalued, and that only rarely anything farther than warming, cooling, or cleansing effects are wont to be expected, recognized, or traced.

In most instances it is an utters urprise if, for example, the statement is made that a cold bath could change the reaction, or the degree of acidity of the urine. This fact is met with such naive incredulity as that of the little child who, when told not to put its little naked feet on the cold floor lest it should catch a cold in the head, asked in turn how that could well be, since the head was so far removed from the soles of the feet.

I shall on this occasion, also, refrain from dwelling on the effects of cold and heat, and stimulating applications (to the body, and to the regions of the stomach in particular) to induce more or less acceleration of the processes of digestion in the stomach, and to change its functions of secretion and motion; for I desire, first of all, to introduce to you my *New Hydropathic Stomach-cure*, considered from a purely clinic point of view.

Madame R. is a delicately framed lady, of about 30 years of age, and mother of two boys, aged 9 and 10, respectively. Four years ago she lost her beloved husband through sudden death, and had to suffer other heavy shocks about the same time. She is descended from a nervously affected family. Shortly after these mental sufferings commenced, she began to be sickly; she became anæmic, out of humor, and irritable. Little by little the entire complex of hysteria symptoms developed in her case. After an intercurrent pleuritis, which had brought her down still lower, these symptoms increased in severity. Vasomotoric, neuralgic, and dyspeptic disturbances of the most vehement kind put in their appearance. A sensation of burning, a visible swelling, and a measurable rise of temperature in one or another part of the body, with simultaneous spastic contractions of the vessels and a marble-like coldness in other parts, alternated with sudden paralysis of single fingers, toes, or of entire extremities. For months at a time, menostases, profuse leucorrhœa, metrorrhagies, ovarial pains, a narrowing of the range of vision, aphony, and occasional cutaneous analgia occurred. The thread which ran through all these varying symptomic manifestations consisted of grave dyspeptic disorders of all sorts, — voracious appetite, and anorexia, cardialgia, tympanites, belching; and finally there occurred, after every partaking of food, vomiting of the same, thus completing a series of symptoms which had objectively no kind of organic lesion to account for it, except a rapidly increasing loss of flesh, tachycardia, and occasionally painful palpitation of the heart, scanty urinary secretion, and anuresis.

Every imaginable internal and external treatment had been consistently tried during a period of three years, but with hardly a passing improvement of condition. A cure tried in Italy had likewise only a very short-lived success.

The patient came under my care in a most lamentable condition, physically and morally. My first task consisted in trying to stop the vomiting after each meal, and to remove the tormenting cardialgia, or at least to reduce the same; for the prospects of improving the condition of nutrition and the nervous state would otherwise be very slender. An examination of the vomit led to no desired results, since it consisted almost always of the unaltered foods that had been eaten, which were thrown up by means of antiperistaltic motions. In a few instances, however, the throwing up of the food was followed by vomiting a very acrid, slimy, watery fluid, containing muriatic acid in considerable pro-

portions, as the tests proved. Artificial attempts to aid digestion were neglected by such seemingly normal secretions of the stomach. Every possible attempt was now made to stop the intolerance of the stomach. But dietetic medication, hydropathic applications,— everything, in short, seemed in vain. Not even a rigid milk-cure, by trying all possible forms of milk, norkephir (a kind of fermented milk, like the Russian koumiss), seemed to prove effective; milk by the spoonful, either cold or warm, could not stay the vomiting, either. Raw, scraped meat, ham, soup, beef-tea, champagne, ice pills, morphine, cocaïne, and every available nervine, cold and stimulating packs, warm cataplasms over the abdomen and the region of the stomach, — all were used, without any satisfactory results. Articles of food which had been given the patient while in a horizontal posture, could be retained a few minutes longer, and a Weir-Mitchell treatment was continued for many weeks; likewise local and general electrization,— but everything was in vain. The anæmia of the skin prevented the stimulating compresses on the body, to which I had recourse again and again, from getting warm, and so they caused only an unpleasant sense of chilliness and discomfort.

Thereupon cold, moist, stimulating compresses on the body, well wrung out before application, were suggested to my mind, combined with the application of a gutta percha tube through which hot water at 140° F. was kept running, directly over the pit of the stomach. This direct local supply of heat more than counteracted the disagreeable sense of coldness, caused by the cold cloths which enveloped the body, since a higher excitant of the nerves counteracts a less intense one. Under this influence, while in bed and in a horizontal position, the patient was supplied with food, which thereupon was retained immediately, and without the least difficulty. From this time on, the patient took everything that was passed to her, while in bed, under the wet bandage, and the tube with hot water flowing through, which appliance, as experience taught, had to be in position about half an hour before food could be safely passed to the patient; and the entire apparatus remained also fully half an hour up to an hour after each meal, in active use.

Not one single time did the patient vomit again, under this mode of treatment. But every time when any of these details were neglected, vomiting returned. At first I allowed only the use of milk, in gradually increasing quantities; but soon solid foods could be and were partaken of and retained.

The appearance of the patient, as well as her real state of health, improved visibly. Soon she increased in bodily weight, and the nervous disturbances became essentially less. About four weeks after commencing this treatment, small meals were passed to the patient while in a sitting posture, without bandages or tube, and were retained by her; only the principal meal was yet taken in a prostrate posture, and with the appliances in active use, as before.

After eight weeks she was in a flourishing condition; her weight of body had been increased by 14 kilos (24 lbs.), the hæmoglobin of the blood which had been as low as 50, stood now at 70, and we could send our patient away cured, although still a little nervous.

You will not wonder that I felt very skeptical toward these so utterly surprizing effects of this mode of treatment. But oftentimes the most unheard-of things prove effective in hysteria, and the autosuggestive way in which this new treatment was introduced, ought certainly to be taken into account. But what surprised me most was the fact that the simple hot applications to the region of the stomach alone, were not followed by favorable results; they could neither stop the vomiting, nor remove the disagreeable feeling, but had, on the contrary, produced pyrosis and troublesome pulsations in the stomach. I therefore looked about

for other ailing bodies, to still further test the method described.

A second case of very obdurate nervous dyspepsia, with vehement cardialgia was healed just as promptly as the first was. A large number of sufferers from gastralgia — such as often accompanies anæmia — and chlorosis were relieved of their pain; their digestion and the formation of blood improved, in a surprisingly short time.

You will understand that in most of these cases, I tried hot applications alone, at first; but almost without an exception, the patients became worse instead of better.

A few cases of simple ulcus ventriculi derived considerable advantage from this treatment, such as cessation of the cardialgia, removal of the subjective difficulties, improvement of digestion and nutrition, and that in many cases of chronic catarrh of the stomach with slow digestion; and in a few instances of dilatation of the stomach the treatment has also seemed beneficial. But how should I interpret the effectiveness of these modes of treatment? I started by asking myself: Why did the direct hot applications to the pit of the stomach, without the cold compresses around the body, not work favorably or give satisfaction in the cases under examination? From a theoretical standpoint I could only conclude that a rather long, intense action of heat would produce a relaxing, and a loss of tonus of the vessels and tissues affected, — conditions which are favorable to passive hyperæmia and hypostases; especially by pre-existing weak circulation, and by anæmia, chlorosis, and chronic catarrhs of the pituitary membrane, such danger is certainly not likely to be disregarded. But such a hot tube, though covering only a limited part of the stimulating compress, must work differently. This stimulating compress consists of several layers of linen cloths, soaked in the coldest possible water, well rung out and well dried; this kind of pack adapts itself to the temperature of the surface of the body, and if it really enlivens the circulation of the skin, it warms up to but little less than the temperature of the blood itself.

In another case, I have found that it is probable, that the difference between the effects of a direct application of heat — cataplasms — and that of the stimulating compresses, that is to say, the warming of cold compresses by transmission of heat from the surface of the body, must be sought in the fact that with the first case was combined angeoparesis, and with the other an active enlargement of the vessels, perhaps under the influence of "checking" nerves. Out of these grow, in both instances as I have shown,[1] totally opposite effects upon the circulation; in the former case, passive hyperæmia; in the latter, an active fluxion. The hot tube, in connection with the cold compress under it, or the bandage around the body, seems to aid the stimulating effect of the latter; even by a heightened anæmia of the skin, its application is made possible, and causes an active fluxion in the mucous membrane of the stomach, too, to remove thereby manifold digestive disorders.

Gentlemen, whether my theory is correct or not, is a matter of secondary importance. Its clinic and therapeutic value you will be able to confirm yourselves, I have not the least doubt, when you give the matter your considerate thought, and test for yourselves the application of the hot tube upon the cold, stimulating compress of the body.

Electricity in a Blacksmith Shop.— A California gentleman suggests the following as the best method of determining whether a horse's foot is being injured by nails not properly directed: Attach the poles of a battery, such as is ordinarily used for medical purposes, one to the horse's bit and the other to the shoe. If the foot is being injured by the shoe or nails, the horse will squirm under the test; otherwise, he will not regard it.

1 "About Little Observed Effects of Hydropathic Antipyresis."

LESSONS IN BACTERIOLOGY.

BY PAUL PAQUIN, M. D.

LESSON VIII. — BACTERIOLOGICAL ANALYSIS OF FLUIDS, SOLIDS, AND GASEOUS SUBSTANCES.

(Continued.)

Part II.—Anaërobic Bacteria.

PASTEUR in 1861 discovered that many micro-organisms live without free oxygen. This was a surprise, which, notably in Germany, created much doubt. The doctrine of *anaërobiosis*, founded on this discovery, was by no means accepted without controversy. However, experimentalists were soon in the field with facts supporting Pasteur's views. This discovery was not only of great immediate value in the study of bacteria, but also of much importance in the study of the physiology of respiration, elucidating many formerly obscure or misunderstood points in the phenomena of fermentation. Close investigations of the affinity of microbes for oxygen, including yeasts and molds, showed a very wide difference, some requiring little or no free oxygen and others a great abundance of it. Between those two extremes, *i. e.*, the *aërobic* to which free oxygen is a necessity, and the *anaërobic* to which it is not necessary and is even sometimes poisonous, there are many intermediate stages or degrees of transition in which oxygen can be dispensed with more or less completely, while several forms are found which live equally well with or without oxygen.

Suppose that one has a tube of gelatinized beef broth in a good, solid condition, and that a little matter from some source or other is inoculated straight down through the mass with a platinum or glass needle so as to leave a puncture easily visible in the medium, any of the following conditions may be noticed within a few days: 1. The growth may be larger on top and gradually decline to a point toward the bottom, in the form of a cone, with the large extremity upward. The shape of this growth's appearance in a tube might be represented by whittling a lead pencil in a very gradual slant to a point a couple of inches in length, and holding the point downward. The reason of this appearance is that the germs are aërobic; they grow best at the top in contact with the free air, and form a large deposit there, while the growth is lighter and lighter in the puncture as it penetrates into the depth of the medium where free oxygen has access, with greater difficulty, and may be almost wanting. 2. Just the reverse appearance of that explained above may present itself; that is, the conical streak of growth may come to a point at the top of the mass of culture medium and spread out as it penetrates to the bottom. This is because the majority of the germs are anaërobic; they live better *not* in contact with free oxygen, and hence develop more luxuriously at the bottom, in the depth of the mass, where free oxygen is very rare, than at the surface where it is abundant. 3. The growth may take place in all parts of the puncture equally well, forming a cylindrical aperture or hole, as wide at the top as at the bottom and at all intermediate points. This is because the air has "neither helped nor hindered" these germs in any part of the growth.

Many apparatus have been invented to cultivate anaërobic microbes, all of which tend to remove free oxygen from the field of culture. None of them, however, remove the last trace of it, though they remove enough to enable the cultivation of these organisms in a satisfactory manner. The simplest way to cultivate anaërobic microbes is to inoculate them in a tube and cover them with agar-agar, or oil, etc. Some methods consist in the use of gas, carbonic acid, and hydrogen, and necessitate the generation of these, a thing not always easy except in laboratories. Any one, however, may cultivate anaërobic bacteria, in a measure, at least, without special apparatus, by various means which exclude most of the oxygen. As the purpose of these lessons is to benefit chiefly those deprived of laboratory apparatus, the students and physicians, I

will give only a method accessible to all.

Suppose it is desired to find and isolate anaërobic bacteria, the first thing is to render the specimen, or part of it, to a liquid or semi-liquid, or to powder by proper means,— crushing it and mixing it with sterilized water if necessary, using all the precautions needed to prevent contamination with air germs, etc., as much as possible.

A small quantity of the material to be analyzed is sown in a test-tube, filled about two inches with nutrient gelatine or agar, melted and cooled to the lowest point at which it will remain fluid. The mass is mixed as uniformly as possible by gentle rotary and vertical motions of the tube, causing the gelatine to move about thoroughly. If successful, a number of colonies will appear scattered throughout the mass, being much more prolific at the bottom and in the depths than at the surface, if the majority of the forms are anaërobic. In such a case, the points of growth will decrease in quantity and size as the colonies approach the surface where free oxygen is more and more abundant. But if the mixture contains germs of both classes, aërobic and anaërobic, then there may be colonies of the former at and near the surface, and colonies of the latter in the depth. Accordingly, in taking microbes from the colonies growing in such a medium, one should recollect these facts, and note which are from the bottom and which from the top.

In such a culture, specks, spots, and drops perhaps will appear here and there in the mass. If the gelatine is liquefied, one can introduce a sterile fine-point glass pipette (capillary tube) sealed at the top, until the open point reaches the liquid growth, then break the top, and a drop will enter the tube. The pipette is withdrawn, and this drop may be inoculated in the depth of another gelatine or agar tube, and thus be isolated and propagated in a state of purity. But if the colony has caused no liquefaction, then it may be necessary to break the tube and cut the culture medium to the colonies, one by one, as many as can be thus reached, and pick them with an inoculating needle, and inoculate in separate tubes for isolation. Thus may one cultivate and isolate anaërobic bacteria without special apparatus, such as vacuum pumps, apparatus to manufacture gas, etc. And, of course, from these colonies one may also make microscopical studies.

For typical cultures of anaërobic bacteria and for their preservation, special methods alluded to in the foregoing must be resorted to.

1. *Culture in gelatine.* Put in a test-tube two or more inches of gelatine medium, to which a substance greedy for oxygen is added, say a small quantity of formiate of soda, and sterilize; let cool down until solidified, inoculate down to the bottom with a long needle (better a long, thin glass point), in such a way as to make only a very fine puncture and not to introduce air bubbles into it. The anaërobic germs will grow at the bottom.

The writer, in trying this method recommended by Salmonsen and others, has obtained better results by sealing the puncture made by inoculation, by melting a little gelatine in the opening of it with a slim glass rod, heated enough to sterilize it, and allowed to cool a little before introducing it into the tube.

2. It is recommended, by Salmonsen again, to cover the culture made by a puncture in a solid medium with an oily substance, as was mentioned in a preceding page. This method is very successful. The process consists in inoculating as in the preceding method and covering the medium immediately after with olive oil, vaseline, or even agar, at 2 per cent, sterilized in water bath, or in a steam sterilizer, and allowed to cool down to but little more than a semi-liquid condition. The layer of substance thus poured on the top of the inoculated solid medium in a test-tube should be about an inch or two thick. Necessarily a little oxygen will be imprisoned by this process, but not sufficient to interfere with the growth of the anaërobiotic microbes.

TRANSLATIONS AND ABSTRACTS

The articles in this department are prepared expressly for this journal.

PSOROSPERMOSE FOLICULAIRE VEGELANTE.

FROM the *Canadian Practitioner*, of Jan. 1, 1891, we quote: "According to Darier, there exists in man a group of cutaneous diseases which merit the name of psorospermosis, being due to the presence in the epidermis of parasites of the order sporozaires, of the group psorosperms, or coccidia. In one of these diseases the coccidia of a particular species invade the follicular orifices of a greater portion of the cutaneous surface, where they appear in the form of round bodies, generally encysted and contained in the epithelial cells, or as refracting granules, the accumulation of which forms a plug which projects from the orifice of the follicle.

"The presence of these bodies enables one to make the diagnosis of the disease, as they are not met with in any analogous clinical affection. The neck of the follicles invaded becomes secondarily the seat of papillomatous vegetations, which can develop to a great degree and form real tumors.

"This affection, from an etiological point of view, should be placed with Paget's disease of the nipple, and probably with molluscum contagiosum."

Darier's case, reported to the International Congress of Dermatology and Syphilis, held in Paris in 1889, had the following characteristics: "The isolated lesions had the appearance of papules surmounted by a crust; but if the latter be removed, it is seen not to be a crust, but a small, obtuse horn plunged into a dilated follicle orifice, and having a softer extremity with a sebaceous aspect. The margins of the orifice are somewhat elevated and papular in character. In the axillary, and especially the inguinal regions, the lesions are larger, conglomerated, and forming by their union true tumors, which become excoriated on their surface. Where the eruption was confluent, as on the sternum, scalp, axillæ, and back, there were brownish crusts."

"The lesions are almost always spread over the greater part of the cutaneous surface, but have points of election where they attain a maximum of development, or at least of confluence; they are, the scalp, face, presternal region, flanks, and especially the inguinal regions. In the first stage the elementary lesion is a small papule surmounted by a dark brownish or grayish crust, which is dry and hard to the touch, adheres firmly to the integument, and is a true horn, imbedded in an infundibuliform depression by a conical or cylindrical extremity, dirty white in color, of semi-solid consistence, and somewhat fatty to the touch. The depression of the skin which receives this horn is slightly entormé at the margins, a little elevated, and manifestly corresponds to a dilated orifice of a hair-sebaceous follicle. Where the lesions are confluent, there is a brownish or earthy-like layer in the skin, more or less fatty to the touch; there is a series of irregular compact elevations, giving a rasp-like feeling to the hand. Removal of this layer shows the skin irregular and rough, riddled with small funnel-shaped orifices; the epidermis is not destroyed, and there is no oozing of blood. In a more advanced stage, the lesions are larger; in certain parts the elevated margin is deprived of epidermis and appears ulcerated, while sebaceous matter, either pure or mixed with pus, can be pressed out of the follicle orifice.

"The disease commences as small papules the size of a pin-head and almost the color of normal skin; as they increase in size, they become somewhat hyperæmic, and in an advanced stage they are hemispherical or flattish in form. The summit of some is excoriated by scratching, and carries hemorrhagic crust. When the lesions become confluent, they form elevated patches covered with flattened, yellowish or brownish corneous or fatty concretions; or the corneous mass may form marked elevated collections, or even papillomatus growths."

Microscopical examination of the lesions in the cases observed by Darier, showed the accumulation of special matter in the neck of the follicle, changes in the epidermis, especially in the rete, and some circulatory disturbance in the corium. The secreting portion of the gland was unaffected. Sections showed that the neck of the hair and sebaceous gland follicle was the principal seat of the lesions, but not exclusively.

The neck of the follicle is dilated, cone-shaped, and filled with a coherent mass of corneous-like material, which extends from the base of the cone to above the general surface, and corresponds to the adherent crust already described.

The rete is hypertrophied, as shown by the presence of abnormal projections of this layer into the corium, both on the general surface and along the hair follicle. There is also a papillomatous growth of the corium toward the epidermis.

These changes Darier believes are due to an organism appearing under the form of round bodies, nucleated and surrounded by a thick membrane and situated in the interior of the epithelial cells, displacing or pushing aside its nucleus. They are present in great numbers in the base of the cup, while the horny plug is composed in great part of the same bodies, which here have become transformed into refracting granules. They are also present in all portions of the rete layer.

In old lesions the projection of the rete into the corium and the papilloma-like new formation of connective tissue was very marked, and resembled closely the condition present in epithelioma.

The Pathology of Stomach Digestion.— The *Semaine Medicale* thus summarizes an important communication upon this subject recently made by M. Hayem to the Medical Society of the Hospitals of Paris: The speaker stated first that the transformation of albuminoid matters in the stomach is effected in two stages. Before being peptonized, albuminoid substances combine with hydrochloric acid, forming acid albumens. In the first stage of digestion, the production of these acid albumens is very active. It takes place at the expense of the fixed chlorides. During the second stage, on the contrary, of the peptonization, properly so-called, of the albuminoid matters, these same products decrease while the fixed chlorides reappear. By registering the quantity of fixed chlorides and acid albumen contained in the stomach at different periods of the digestive process, M. Hayem has determined the state of the digestive process at each of these periods. The process may be accelerated or retarded. There are, hence, two classes of morbid conditions relating to stomach digestion,—those which result from acceleration of the digestive process, and those resulting from delayed digestion. From the facts peculiar to these different types of morbid conditions relating to the digestive process, M. Hayem formulates a general law, as follows: —

In the absence of mechanical obstacles to the passage of the contents of the stomach into the intestine, the evacuation of the stomach appears to depend upon the evolution of the digestive process, as to whether it is intense or feeble.

When the stomach has accomplished the work which it is capable of doing, it relieves itself of its contents. On the contrary, when under the influence of a particular kind of irritation, the work of the stomach is delayed, or even when it continues, the evacuation of the stomach is retarded. As the development of the digestive process itself depends upon the quantity and quality of the gastric secretions, one may say, as a conclusion, that the motor troubles of the stomach appear to be governed by secretory changes.

In various recent publications there has appeared, notably in foreign countries, a tendency to explain most of the forms of dyspepsia by the aid of supposed nerve vaso-motor disorders. According to these theoretical views, gastric atony, ending ultimately in dilatation, is most often primary, and capable of explaining the modifications of the chemical process.

A careful examination of the facts does not support these fantastic conceptions.

M. Hayem, in reply to a question raised by M. Mathieu, remarked that according to his observation, in the majority of cases in which the nervous phenomena connected with disorder of the stomach appeared first, they have been, in reality, preceded by some changes in the chemical actions of the stomach.

The Value of Lotions in Diphtheria. — P. Kastenko and F. Grabovski recently made a careful study of the therapeutic value of some of the substances more commonly employed as lotions in the treatment of diphtheria. Solutions of the following substances, according to the *Bulletin General de Therapeutique*, ordinarily employed in the treatment of diphtheria as gargles and in compresses, have been examined by the same investigators, from the point of view of their effect upon the bacilli of diphtheria:—

Alum 3 per cent, phenic acid from 1 to 2 per cent, corrosive sublimate 1–5,000, hydrochloric acid 1–1,000, boracic acid 4 per cent, citric acid 5 per cent, salicylate of soda 5 per cent, chlorate of potash 3 per cent, solution of chloride of iron and glycerine, equal parts; one part of iodine, two parts of iodide of potash in 300 parts of distilled water; essence of turpentine, essence of peppermint.

The following substances destroyed in one minute the cultures of the diphtheria

bacillus upon agar: Corrosive sublimate 1–5,000, alcohol at 85 per cent, solution of equal parts of perchloride of iron and glycerine, iodine one part, iodide of potash two parts, distilled water 300 parts; a 2 per cent solution of phenic acid.

A 5 per cent solution of salicylate of soda, or citric acid, destroyed the cultures in five minutes.

The following solutions destroyed the cultures in 30 minutes: Alum 3 per cent, phenic acid 1 per cent, hydrochloric acid 1–1,000, alcohol 42 per cent.

No effect was produced by essence of turpentine or peppermint in five minutes. A 3 per cent solution of chlorate of potash, and a 4 per cent of boracic acid, produced no effect in 30 minutes.

A New Remedy for Psoriasis— Gallacetophenone.— Pyrogallic acid is so valuable a remedy for psoriasis that its use is still continued by many dermatologists, notwithstanding its relinquishment by others on account of the frequent occurrence of systemic poisoning, sometimes even fatal, following its use. According to the *Semaine Medicale*, however, it may now be dispensed with, as Nencki has succeeded in producing a derivative substance which he terms gallacetophenone, which possesses all the therapeutic properties of gallic acid, and is non-poisonous. The remedy produces excellent results in the form of an ointment, one part to nine of the medicine, good effects appearing within a few hours from the first application. The new remedy also has the advantage that it does not soil the clothing of the patient. Gallacetophenone is a yellow powder. It is soluble in hot water, alcohol, ether, and glycerine. Its solubility in cold water is slight, but is increased by acetate of soda. The following formula is a suitable solution: —

Gallacetophenone	4 parts
Acetate of soda	30 "
Hot water	100 "

Ventilation as a Means of Disinfection.— The value of ventilation as a means of securing air purity cannot be questioned; nevertheless, there seems to be good ground for the belief that the popular faith in ventilation is considerably exaggerated. Recent researches concerning the character and properties of ptomaines and other poisonous products of bacterial origin, have clearly shown the fact that the injurious results following exposure to an impure atmosphere are not due to the foul odors inhaled, but to the microbes by which the foul odors are produced. Any system of disinfection, to be effective, must be capable of destroying or removing these organisms.

Dr. Richard Stern has recently made an exhaustive study of this subject, mixing pure cultures of various microbes with dust collected from factories and schoolrooms. He diffused the dust thus prepared throughout the atmosphere of a room specially arranged for the investigation, and then made a careful study of the air under different conditions, employing Petri's method for estimating the number of micro-organisms in a given quantity of air. The conclusions arrived at are, according to the Boston *Medical and Surgical Journal*, as follows:—

"1. The micro-organisms rapidly sink to the floor in quiet air. The finer the dust upon which the micro-organisms rest, the slower the gravitation. 2. The usual ventilation, effecting a renewal of air from one to three times an hour, has no effect upon the removal of micro-organisms with summer ventilation, and only to a very limited extent with winter ventilation. 3. Ventilation, effecting a more rapid renewal of air (six or seven times to the hour), effects the removal of micro-organisms but slightly, without a sensible draught. 4. A rapid and complete removal of the micro-organisms from the air is only attainable with a strong draught. 5. Micro-organisms are not blown off from the floor, walls, furniture, clothing, etc., even with the stronger draughts. 6. The evolution of steam in a room is not capable of rapidly and completely precipitating the micro-organisms, although it hastens this process to an appreciable extent.

Speaking without a Larynx.— At a meeting of the Royal Society of Physicians, at Vienna, an interesting discussion recently occurred respecting the existence of the function of voice without a larynx. A man was present from whom the entire larynx and part of the œsophagus had been removed for carcinoma. He was able to speak very well by the aid of an artificial larynx. Schroetter related a case in which, after removal of the larynx, there was a sort of reproduction of the vocal cords, or, rather, a production of folds of mucous membrane which served the purpose of vocal cords sufficiently to enable the patient to speak. Schroetter

and Stoerk also reported each a still more remarkable case, in which not only the larynx but a considerable part of the pharynx was removed, so that there was no communication whatever between the mouth and the trachea, the patient breathing by means of a tube placed in the trachea. These patients were able to talk, notwithstanding. Schroetter thinks that in these cases a sufficient amount of air may be forced out from the stomach and œsophagus to enable the organs of voice and the mouth to form words.

Celluloid Substitute for Bone.—Billroth, and other German surgeons, report success in the use of celluloid to replace portions of the skull which had been loosened by injury necessitating their removal. When the operation is done aseptically, suppuration does not occur.

Treatment of Stricture by Electricity.—M. Long, of the Medical College of Vienna, considers electrolysis the proper method of treating strictures of the urethra when the contracted portion involves the cavernous portion of the urethra, but prefers surgical treatment when the spongy part is affected.

Brown-Sequard's Elixir.—M. Brown-Sequard still continues the use of his extract of the genital glands of rabbits and guinea-pigs, and recently reports a number of cases of ataxia, diabetes, and pulmonary tuberculosis, which have been greatly benefited or cured by his injections.

Effect of Vinegar upon Digestion.—Modern laboratory investigations are bringing into question the propriety of using as food numerous articles which have almost universally been accepted as harmless or useful articles of food. Dr. Roberts showed, long ago, that tea and coffee hindered digestion. Condiments have been interdicted in consequence of the irritating effect upon the stomach and kidneys The microscopists have discovered that the eels of vinegar sometimes take up their abode in the alimentary canal as parasites, and become a source of irritation and disturbance to the digestive organs; and now, according to Virchow's archives, John has been investigating the influence of acids upon salivary digestion or the conversion of starch into sugar, and the fact has appeared that acetic acid connected with tartaric and oxalic acids, very materially hinders this portion of the digestive process. It is worthy of note, as being in the line of scientific progress, that many of the most skillful chefs are substituting, in their culinary processes, lemon juice for vinegar, thus avoiding at once both the wriggling eels and the mischief-making acid.

Gout and the Use of Sugar.—Dr. Jonathan Hutchinson, the great London physician, forbids his patients who are suffering from gout the use of cooked fruits if eaten with sugar. The employment of cane sugar he finds particularly injurious. Ripe fruit eaten raw, without the addition of sugar, is harmless, while cooked fruit to which sugars have been added, are almost certain to produce an attack of the disease in persons subject to gout.

Methyl-Blue as Antiperiodic.—Drs. Goodman and Ehrlich, physicians to the Moabite Hospital at Berlin, have been experimenting with this new therapeutic agent in the treatment of malarial fever. Recognizing the facility with which the white blood corpuscles absorb this staining agent, and especially the facility with which the Laveran parasites are stained by it, it occurred to them that this agent might be useful as an antiperiodic remedy. They accordingly employed it in two cases of malarial fever, one of the tertian and the other of the quotidian variety. Under the influence of the remedy the paroxysms ceased in a few days, and the parasites disappeared from the blood within eight days. The remedy was administered in capsules, in doses of ten centigrams (one and one half grains), repeated five times in twenty-four hours, at intervals of three hours in the tertian case, and at intervals of one hour in the case of quotidian fever. The remedy was given from ten to twelve hours before the expected appearance of the chill. The patients continued to take methyl-blue for eight or ten days after the fever disappeared, taking each day fifty centigrams (8 grains).. During the treatment, the urine retains an intense blue color and is somewhat increased in quantity, but contains no albumen. The stools are not blue when passed, but become blue after exposure to the air, as the result of the oxidation of the reduced methyl-blue which they contain. The patients have continued well since their recovery.

BACTERIOLOGICAL NOTES.

[The notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE from original sources.]

Prevention of the Multiplication of Disease Germs.—"In regard to the disease-producing or pathogenic germs," says the *Sanitary News*, "it is important to understand what forces or agencies will retard their multiplication or wholly destroy them. In emergencies, chemistry is resorted to, and antiseptics and disinfectants are employed; but in the proper prevention of disease, such emergencies should not be allowed to arise. Sunlight, pure air, and thorough cleanliness are natural enemies to disease germs. They cannot flourish where they have not their proper food, and that is found in dampness, darkness, mold, and filth. Keep the habitation flooded with sunshine and pure air, keep away all filth and dampness, and the germs of disease will find no foothold, no nidus in which to breed or food on which to grow. Nature is struggling all the time to keep her domain healthful, and a fit habitation for man; but man shuts out the air and light, contaminates all things about him, and disease is the reward of his recklessness and neglect. There is more health in a sunbeam than in drugs, and more life in pure air than in the physician's skill. The sunlight may fade your parlor carpet, but better that than have disease fade your cheeks. The wind may tan and freckle the face, but it is better tanned and freckled than thin and sallow. Help nature to keep your habitation healthful by allowing her forces an opportunity to operate. There is more health about you than disease. Health is man's natural condition. He has to violate some law before the penalty of disease is inflicted. He can place about him such conditions that disease germs will invade his system, or he can live amid surroundings so pure that health will bless him both in his freedom from physical ills and in the sweet consciousness of right living."

Bacterial Products.—Mr. Buckner,[1] who has studied the effects of bacterial products in inflammation and suppuration, concludes as follows:—

"The products secreted by bacilli, such as toxines, ptomaines, toxalbumins, belong to the nerve poisons, and all of them, with the exception of cadaverine and putrescine, are devoid of pyogenic properties, and have but a slight action on the leucocytes, which are in great part the subjects for suppurative fluids.

"This fact would point to other substances in the products of suppuration, to explain the phenomena of pyogenic infectious processes. Such agents were found to exist. Buckner, Nencki, Lange, and Roemer have demonstrated them in the plasma of pyogenic bacteria. These substances are proteids (or proteins) possessing positive pathogenic properties on leucocytes."

[1] *Centralblatt fur Chirurgie*, No. 50, 1890.

A New Use for Tuberculin.—The Board of Health of Philadelphia has found a new and very practical use for tuberculin. This enterprising Board is paying great attention to the milk supply of Philadelphia, and had great difficulty in determining in some cases whether or not certain cows found in dairies supplying the city were or were not tuberculous. Experiments made by the Veterinary Department of the University of Pennsylvania show that Koch's tuberculin is capable of detecting tuberculosis in the early stage of the disease in cows as well as in human beings.

Milk and Microbes.—Just after the medical profession, and to some extent the laity, have become thoroughly impressed with the idea that milk should be boiled before being eaten, to insure the destruction of the microbes which it contains, Dr. Freudenreich comes forward with a series of experiments by which he claims to prove that fresh raw milk possesses remarkable germicidal properties. According to his experiments, the bacillus of cholera, when put into fresh cow's milk, dies in an hour, the bacillus of typhoid fever succumbs at the end of twenty-four hours, while other germs die at the end of varying periods. Milk which has been exposed to a temperature of 131° F. loses its germicidal properties. Milk which is four or five days old is also devoid of microbe-killing power.

How are these results to be reconciled with previous observations? This is a question which the bacteriologists must settle by practical experiments. We hope to be able to report soon some results of work done in the Laboratory of Hygiene, bearing upon this question.

INDUCED IMMUNITY AGAINST PNEUMOCOCCUS.

Dr. Klemperer has shown that immunity against the pneumococcus septicæmia may be induced by the employment of the serum of immune animals, or by means of a bouillon-culture of the pneumococcus. The serum of rabbits which have been rendered immune will also produce immunity against the pneumococcus infection. Serum seems to have the power to destroy, not the pneumococcus itself, but the poison which it generates.

The introduction of the serum of immune animals into the systems of persons suffering from pneumonia has been tried by way of experiment, with encouraging results. The temperature and pulse were reduced, and in two cases the temperature remained normal; in the other cases, it rose again at the end of six hours. There is doubtless a very great future in this line of experimentation. The time may come, and it is possible that the day may not be far distant, when we shall be able successfully to fight germs with germs; or, if the germs themselves are not brought face to face in the battle, the weapons with which they make their attack — certain characteristic poisons which they produce — may be so used that the deadly poison developed by one germ may be successfully neutralized by the poison produced by some other germ, or by the same germ under different conditions.

The Pneumococcus and Cerebro-spinal Meningitis.— Dr. Netter, Director of the Laboratory of Hygiene of the Faculty of Medicine, of Paris, has according to Dr. J. Burdon Sanderson in the *British Medical Journal*, made some very remarkable experiments which indicate that the pneumococcus which has been shown to be closely associated with croupous pneumonia, is also associated with other specific and acute inflammations, particularly epidemic cerebro-spinal meningitis. Zaufal has shown that otitis of the middle ear is also associated with the pneumococcus. This microbe is the same which was discovered a number of years ago by Sternberg, who observed that rabbits injected with saliva from his own mouth died of septicæmia.

It is not probable that the pneumococcus is alone sufficient to produce pneumonia, or perhaps any other disease, but it is, as Dr. Sanderson suggests, a sort of sword of Damocles, which is in readiness to fall at any moment when the conditions become favorable, as the result of exposure to cold, or other influences which reduce the resisting power of the body.

The pneumococcus is found to be constantly present in the mouths of persons who have recently had pneumonia, and is often found in the mouths of persons who are in perfect health, and have been for an indefinite period. Its constant presence for some time after an attack of pneumonia doubtless explains the readiness with which relapses occur after this disease.

Enzootic Cerebritis in Horses.— Dr. N. S. Mayo, of the agricultural College of Kansas, has investigated the enzootic disease of horses that prevail in that State and many other States during certain seasons, and has come to the conclusion that it is due to the germination of the spores of the *aspergillus glaucum* in some important organs of the body, notably the kidneys and liver; and the formation of abscesses in the cerebrum as a result of the distribution of mycelia and spores by means of the circulation. The investigations will prove very useful, as they bear the evidence of having been carefully made, and many thousands of dollars are lost annually to stock owners, by this, so-called "mad staggers". The disease originates from the ingestion of moldy corn — the mold, in this case, being the *penicillium glaucum*.

Luminous Bacteria. — Various phenomena of illumination in the darkness of night, in the woods, marshes, and the sea, have been noticed from time immemorial, and not very long ago they were attributed to supernatural powers — spirits, for instance — by the superstitious. It is now established that they are the result of some form of microbic vegetation. The phosphorescence of a rotting stump in a marsh, of a fish in the sea, is due to such low life. Mr. Giard, a French naturalist, has recently observed a bright phosphorescence in a crustacean, the *Talitrus*, a specimen of which he found slowly walking on the beach. He found that the luminous condition emanated from the diseased muscles which contained phosphorescent bacteria. By inoculation he reproduced the microbes in the muscles of other crustacea and the same luminous appearance.

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NOTICE TO SUBSCRIBERS.

THE BACTERIOLOGICAL WORLD has widened its field to include MODERN MEDICINE, enlarged its form, secured the old collaborators, engaged new ones among the foremost scientific men of Europe and America, and reduced its subscription price to two dollars per year. This certainly ought to be an inducement to new subscribers to at least try our periodical for a few months.

The year of subscription of every one whose first number dates back to January, 1890, *ends with this copy.* We respectfully solicit renewal at an early date, that we may enter the names promptly at the beginning of the year 1892. We go to press on the 15th of every month.

LA GRIPPE AND CONSUMPTION.

DR. STICKLER'S timely article, which appears in this number, was mentioned editorially in our last because it was to appear in that number. It was a little too late, however, and we are pleased to give it space in this issue. It expresses facts which will doubtless be of much value both to practitioners and patients.

IMMUNITY.

THREE theories are now chiefly discussed to explain immunity against disease: Phagocytosis, the germicide action of body fluids, and the interference of protective proteids of the cells. Each of them have their foremost advocates in men learned in medical sciences,—trained thinkers, respected the world over, and in whom the medical world has much confidence. The first finds its strongest expounder in Metchnikoff, of Pasteur's Laboratory, whose investigations have attracted universal attention.[1] The second in Mitchell Prudden, Buchner, and other equally brilliant and energetic investigators; the third in Hankin and his disciples.

Some of these theories, supported by very plausible and even convincing arguments and experiments, are claimed to be the exclusive cause respectively of what is known as immunity or antagonism of the body to the action of virulent matter. Others are more liberal, broader in their acceptation.

However, these theories, though they are great achievements, are not fully satisfactory. Each one separately, and all collectively, fail to reach the fundamental principles. Each is limited, and rests on an accepted obscure conception of what, in our ignorance, we term vital force. Not one proves the laws underlying immunity. Though they have advanced our knowledge wonderfully on the subject, they do no more than point to particular methods by which nature resists the invasion of virus, destroys it, or allows its existence in the body without damage to the tissues, etc. Metchnikoff, in his admirable work, has shown us the battle between the cells of the body and the cells of the enemy, and spread before our astonished eyes one of nature's most potent methods of warfare, the digestion of micro-parasites by phagocytes.

Buchner, Prudden, etc., have shown by admirable essays and experiments how nature poisons, as it were, the parasitic intruders by some elements of the fluids of the body.

Hankin has demonstrated how each cell may be armed with a fearful poisonous protein, which deals death blows to microbes. Thanks to those brainy, pa-

[1] See plates explaining his views in November number.

tient men for this progress. All these facts tending to advance the settlement of the questions of immunity, are so many great obstacles removed by science from the way of preventive medicine, but none explain immunity fully.

It remained for one less famous in the medical world to advance, we believe, the first expression tending to explain the actual laws underlying immunity. We are indebted for the most logical conclusion on the matter, to a thinker who worked undisturbed by the clash and rivalries of science, in a remote corner of the earth, if we judge from a scientific point of view. We refer to Dr. J. W. McLaughlin, of Austin, Texas, whose first article on the problem appeared as far back as 1887, in Daniel's *Medical Journal* (Austin), and who, in 1890, published a remarkable essay on the same question.[1]

And yet, strange to say, little heed was paid to this truly meritorious publication. Was it because it emanated from one whose modesty seems to keep him in the background, in a country remote from the leading scientific centers? Or was it because it was too scientific, too far above the average mind, to be grasped, and even beyond the reach of some who write on the much discussed problem? We suspect it was due in a measure to both causes.

The explanation of Mc Laughlin rests on accepted laws of physics and chemistry: the law of wave motion, the laws of atomic attraction, vibration, disruption. Assuming that the molecular and atomic theories accepted universally by the foremost physicists, chemists, and most scientists, are true, and that Huxley and others of his school are right in their conclusions that the forces at work in organic and inorganic matter are identical, we cannot dismiss Mc Laughlin's explanation without study, if we are sincere in our zeal to find the truth and willing to accept it, irrespective of its place of birth, and unmindful of the *eclat* of glorious and renowned reputations to back it.

[1] The latter was published in full in our issues of August and September.

Mc Laughlin's article advanced one of those forcible, revolutionizing thoughts which, in 1887, was too far ahead of his time to be considered calmly by searchers, or at all by most of men. Now it demands a hearing, and is deserving of it. How would it have been if a foreign celebrity had advanced it from a lofty chair of science, instead of Mc Laughlin from the *sanctum sanctorum* of a practicing physician in Texas? We suspect that a crowd of enthusiasts would have flocked abroad to have a personal explanation of the wave motions of the microbic and animal substances, and to have a peep, if possible, at the sublime sight of atomic union, liberation, disruption of albuminoids, and their union in various ways to form ptomaines, etc., etc.

But of course a discovery in America can never be, *for Americans*, as grand and true as a discovery in a foreign land.

Mc Laughlin's explanation of immunity does not exclude the theories of Metchnikoff, Prudden, and others; it is an exposition of the laws underlying them all. In fact, it explains the laws of any theory of immunity yet to be conceived so long as the wave-motion law holds. P. P.

THE CAUSE OF NERVOUS HEADACHE.

THERE are few practitioners who have not frequently found themselves baffled in their efforts to relieve a chronic sufferer from nervous headache. The inefficiency of all the remedies which have been proposed for this malady, is evidenced by their number, and the eagerness with which every new remedy proposed is grasped and submitted to trial. Antifebrin and antipyrin, and the various other analogous drugs which have recently been recommended for this distressing affection, although at first vaunted as panaceas, soon prove to be as inefficacious to effect a permanent cure as older remedies. The real cause of failure is not due to the stubbornness of disease, but to a failure to recognize its cause. In a great majority of cases a careful investigation will show

that the patient is suffering from the retention of decomposing fecal matter in the large intestine. Most patients suffering from nervous headache, suffer habitually from constipation, or, if questioned, will state that the single daily stool is ragged and very foul smelling.

The administration of a large enema, or better still, a colo-clyster, in these cases, will almost invariably bring away a large amount of fecal matter which has been retained, notwithstanding the daily evacuation. Doubtless there are a large number of persons suffering from fecal accumulations, who have regular daily stools, and suppose their bowels to be in a perfectly healthy condition. These retained fecal matters contain a great number of microbes, which, under favorable conditions for growth, develop poisonous ptomaines, which, as has been clearly shown by the recent researches of Trastour, Bouchard, Brouardel, and other pathologists of the French school, play a most important role in the production of a great variety of symptoms hitherto little understood.

Leven has shown that attacks of nervous headache are usually accompanied with tenderness of the solar plexus, or the abdominal sympathetic — especially the lumbar ganglia of the sympathetic. It will be found that the two conditions, hyperæsthesia of the lumbar sympathetic, and poisoning by the absorption of ptomaines developed in retained fecal matter in the large intestine, usually co-exist, and we have seen extreme tenderness of the lumbar sympathetic ganglia disappear within an hour after the administration of a colo-clyster and the thorough evacuation of the contents of the large intestine. It is my experience that nothing is so valuable as a means of cutting short an attack of nervous headache, and preventing an occurrence of the disease, as a complete clearing out of the large intestine, which may be readily accomplished by the administration of a large enema, the patient being placed in the knee-chest position. An enema taken in this way is called by Dujardin-Beaumetz an *enter-clyster*. We prefer the term *colo-clyster*. Two quarts of warm water are generally found to be amply sufficient for the purpose. Sometimes two or three repetitions of the treatment are necessary thoroughly to remove from the colon old accumulations. After injection, the water should be retained a little time and the bowels should be manipulated with the hand, either by the patient or by an attendant, so as to cause the water to pass as far up in the colon as possible. If the patient is very feeble, the colo-clyster may be administered with the patient lying in a half-prone position. The patient should lie the same as in the Sims position, only turned toward the right instead of toward the left side.

The benefit derived from this treatment is not only through the removal of fecal matter, but, through the absorption of a portion of the water introduced, the kidneys are aided in the elimination of the poison from the system. If the water employed is quite warm, it will also produce profuse perspiration, by which the elimination of the poison is likewise assisted.

The colo-clyster, even when thoroughly employed, will not always give immediate relief to a person suffering from an attack of nervous headache, but will almost invariably shorten it, and if employed once or twice a week, or whenever there is evidence of fecal accumulation, will go farther toward the prevention of subsequent attacks than any other remedy. The use of a small quantity of water in these cases is worse than none at all, as it encourages the development of microbes, and facilitates the absorption of ptomaines by bringing them into solution.

J. H. K.

CYSTERS AND TYPHOID FEVER.

THE scavenger habits of the oyster render it peculiarly liable to become a vehicle of the infectious material of typhoid fever and other allied diseases. The *British Medical Journal*, in an editorial, thus discusses the relation of oysters to typhoid fever:—

"The question of the causation of typhoid fever by the ingestion of oysters growing in polluted estuaries has come into public prominence in connection with the illness of His Royal Highness Prince George. It is not for the first time. At the meeting of the British Medical Association in Cambridge, Sir Charles Cameron, the present medical officer of health for Dublin, read a paper entitled "Sewage in Oysters," in which he pointed out that oysters growing in estuaries and other places to which sewage has access must often contain sewage matter. Indeed, he found this to be the case in oysters collected in Dublin. So lately as September 20, 1890, he recorded in the *British Medical Journal* a series of cases of enteric illness (fortunately not fatal) from apparent poisoning by oysters, referring also to four fatal cases of poisoning by mussels, in the case of Mrs. O'Donner, and her family, which created a great and painful impression earlier in the year, and were reported in our columns of July 19; in this case also, the mussels were in contact with sewage water; and he notes that in nearly all the cases of mussel poisoning on record, they were in contact with sewage or stagnant water, although there is a tendency to refer mussel poisoning to other causes. It may be remembered, also, that Dr. De Fabeck reported in our pages cases of typhoid fever attributed to poisoning by sewage-polluted oysters in Naples, and called attention to the danger of eating oysters — a danger to which, from personal experience, we can testify. There were, it may be added, a great many persons in Dublin last winter who attributed attacks of typhoid fever and diarrhea, etc., to the use of oysters."

Dr. Segers, of Buenos Ayres, a surgeon in the navy of the Argentine Republic, recently described, according to the *British Medical Journal*, a newly observed disease which he denominates "chronic mussel poisoning." In a recent visit to Terra del Fuego, he made a careful study of this disease. The following are the principal symptoms: Marked jaundice, hypertrophy followed by atrophy of the liver, and hemorrhages from the various mucous surfaces. The last-named symptom is speedily followed by death.

The disease prevails among the Fuegians to such an extent as to threaten the extinction of the race. Mussels are very abundant on the Fuegian coast, and the natives depend on them largely for sustenance. Their nutritive value is so small that a large quantity is required to support life,—the Fuegian sometimes eats from ten to twenty pounds of mussels in a day. It seems that the condition of the mussels varies with the state of the moon, the creature becoming poisonous during the wane of the moon, at which time a great number of the mussels die. It is believed by Segers that the poisonous ptomaines produced by the decomposition of the dead mussels are absorbed by the survivors, and that this is the cause of the disease produced in those who eat them. By feeding the mussels to fowls, Segers was able to produce symptoms similar to those observed in human beings. Injections of extract of the livers of diseased mussels, prepared at a temperature sufficiently high to destroy microbes, caused in fowls, in mild doses, a sort of intoxication, a staggering gait and a rise of temperature. Large doses were followed by dilation of the pupils, coldness of the extremities, tremor, weakness of the heart, and death.

From the toxic effect of the injections with liver extract prepared at a temperature sufficiently high to destroy microbes, Dr. Segers concludes that the mussel poisoning is chemical in character, and not microbic. The disease in human beings may be successfully treated in the first stage, but in the second stage, when atrophy of the liver has begun, the disease proves rapidly fatal in spite of all treatment.

The accumulation of evidence against the oyster as an article of diet seems to be rapidly increasing, and it appears safe to predict that the time is not far distant

when this delicacy will be discarded as too risky a morsel for human consumption. J. H. K.

TOBACCO USING AND PHYSICAL DEVELOPMENT.

Dr. Jay W. Seaver, medical director of the Yale gymnasium, and professor of physical culture in Yale University, has been making a careful study during the last eight years, of the influence of tobacco upon development. His statistics show that non-smokers were 20 per cent taller than smokers, 25 per cent heavier, and have a lung capacity 66 per cent greater. These figures are wonderfully significant, especially the last. A man who has a lung capacity two thirds greater than that of another man has an immense physical advantage. His prospects for long life are greater, and his physical efficiency will be certainly as much greater as his breathing capacity. A man with small lung capacity is like a furnace with a small draft. All his vital activities must be inferior to those of a man of greater lung capacity.

Similar observations have been made at Amherst college, with like results. In a recent graduating class, the non-smokers were found to have gained in weight over the smokers nearly one fourth. The non-smokers surpassed the smokers by a gain in height of 37 per cent, in chest circumference 42 per cent, and lung capacity 8.36 cubic inches.

Science recently published the results of an experimental inquiry into the condition of thirty-eight boys of all classes of society, of average health, who had used tobacco for different periods ranging from two months to two years. Of the thirty-eight, twenty-seven showed severe constitutional injury and stunted growth. In thirty-two there were irregularities of the heart action, stomach disorders, cough, and a craving for alcoholic liquors. Thirteen had intermittent pulse, and one had consumption. All were induced to discontinue the use of tobacco, and as a result, in six months one half were free from their former symptoms, and by the end of the year the entire number had recovered, thanks to nature's recuperative forces. Suppose these young men had continued the use of tobacco for a series of years longer; the disorders which were so clearly defined would have become more or less permanent, and the return to health after a discontinuance of the drug would not have been so speedy and complete. Hundreds of thousands of persons are living in a state of chronic poisoning from the use of tobacco. Their vital powers are depressed to such an extent that their physical, mental, and perhaps moral efficiency are vastly inferior to what they might be without the depressing influence of this toxic incubus.

The evidence of these statistics is overwhelmingly convincing, and ought to set every intelligent young man who is beginning to patronize the pipe or cigar to thinking earnestly whether he can afford to subject himself during the best part of his life to chronic nicotine poisoning. Physicians might do more than any other class of men to eradicate the enormous evil of tobacco using, if they would discountenance its use by precept and example. J. H. K.

Calomel and the Liver.—Since Dr. Bennett's experiment on dogs, made many years ago, by which he showed that the administration of calomel diminished rather than increased the production of bile, there has been much discussion respecting the value of this drug as a cholagogue.

The clinical results obtained by its use have seemed to confirm the traditional notion of its liver-stimulating qualities to such a degree that practitioners have continued to employ it, as Dr. Palmer, of the Michigan University, once said with much warmth, when confronted by the results of physiological experiment, "in spite of Dr. Bennett and all the dogs of Edinburg." Numerous repetitions of Dr. Bennett's experiments have, however, uniformly arrived at the same results.

Rutherford and Provost assert most positively that calomel administered in the usual way diminishes the secretion of the bile. The change in the appearance of the stools observed after the use of calomel, and which has usually been attributed to an increased discharge of bile, has been shown to be really due to a coloration produced by the calomel. That calomel is beneficial in certain cases in which the liver is supposed to be at fault, there is too much clinical evidence to allow room for doubt; nevertheless, the results of modern pathological studies seem to show that in the conditions in which calomel is ordinarily prescribed, the fault is not with the liver, but rather with the digestive tract. The liver is overwhelmed with an enormous quantity of poisons, ptomaines which are produced by the action of microbes in the alimentary canal. Calomel is a good antiseptic. By the destruction of these microbes, or the inhibition of their development, the production of ptomaines is checked and thus the liver is relieved. We arrived at this explanation of the apparent cholagogic effects of calomel some years ago, and are glad to see that so good an authority as Dujardin-Beaumetz has recently advanced the same idea. It should be added that many practitioners still use the drug in quantities unnecessarily large; for all the advantages of the drug, in cases in which its use is capable of benefit as a germicide, may be obtained by repetition of small doses as well as by by the use of large ones. J. H. K.

Headache Cured by Massage.—Massage of the head is one of the very best remedies for certain forms of headache. Headache affecting the back part of the head, is particularly amenable to this mode of treatment. In some cases of chronic headache which are persistent, and resist all other methods of treatment, there will be found to be certain points at which the tissues are thickened and indurated, chiefly located about the base of the skull, sometimes midway between the skull and the *vertebræ prominens*. Careful manipulation of the affected parts, giving particular attention to the nodosities should any exist, is one of the best means of relieving occipital and various forms of persistent headache.

In applying massage to the head, the fingers should not be allowed to slip over the surface of the scalp, but they should be pressed firmly upon the surface, so that the whole scalp will be moved, down to the bone. By this means the rigidity of the subcutaneous tissues, which is frequently found in these cases, will be overcome, and as the tissues become more pliable, the headache will disappear. We have often secured relief from a persistent headache by this means, within fifteen or twenty minutes. J. H. K.

Arsenic in Skin Disease. — The routine employment of arsenic in skin diseases has been a source of much evil. The writer has met a number of instances in which acute inflammation of the kidneys has been induced by this routine practice, and great mischief has been done. A young lady, the daughter of a physician, consulted us some years ago, being sent by her father, for chronic eczema. On inquiry whether arsenic had been tried, the patient replied in the negative, saying her father, an eminent and experienced physician, had told her that she had better suffer from the skin disease than chronic arsenical disease. We are not condemning the use of arsenic altogether, but only oppose its indiscriminate use. We are glad to note that so eminent a medical authority as Jonathan Hutchinson, of London, has recently called attention to this evil, particularly in the treatment of elderly persons. There are few cases of eczema or other chronic skin disease, which cannot be cured by careful regulation of the regimen of the patient, and local applications, and without resorting to the prolonged use of arsenic, or any other constitutional remedy. J. H. K.

REVIEWS.

Etiology and Prevention of Yellow Fever. — By Major George M. Sternberg, M. D. This report from the U. S. Marine Hospital Service, published by order of the Secretary of the Treasury, is a fine specimen of art, and an excellent exposition of the deep researches of the author, and several others, on the cause and prevention of yellow fever. It contains no less than 21 full-page plates, illustrating the various micro-organisms that have been found from time to time by various investigators in connection with this disease.

Dr. Sternberg completely demolishes Dominigo Friere's beautiful ideas, and shatters as well the theories advanced by Finlay, Carmona, Gibier, Billings (Frank S.), and Tacerda, all of whom had a particular germ to which they attached some importance from an etiological standpoint. Much credit is due to Dr. Sternberg's admirable work. We only regret that, notwithstanding his studious and conscientious labors, the author must acknowledge that "the specific infectious agent in yellow fever has not been demonstrated."

Practical Points in the Management of Diseases of Children. — Prof. I. N. Love, M. D., St. Louis, Mo.; Geo. S. Davis, publisher, Detroit. As might have been expected by those who know Dr. Love and his medical equipment and experience, this little volume is essentially practical. It is not to follow a conventional method of reviewing that we say "it fills a want" in medical literature. There are few gaps now among medical publications, except in the advance line of thinkers and modern practice, but Dr. Love's book pushes its way among the practical and reliable works, and at once shows us that there was a gap. No man can speak with more authority than Dr. Love on the diseases of children. His great love and sympathy for the little ones; his years of study and practice among them; his teachings on the subject of their maladies; his peculiar and rare magnetism with the young, have fitted him to write just such a book, which should be in the hands of not only doctors, but mothers, and parents of both sexes.

The Physician's Visiting List. — By Lindsay and Blakiston. P. Blakiston, Son & Co., publishers, Philadelphia. This little pocket book is a most complete and yet exceedingly simple account and reference book combined. It presents in a compact form the metric system; converting tables of apothecaries, and the gram system; posological tables in English and metric systems; new remedies; incompatibilities, poisons and antidotes; disinfectants; examination of urine; etc., etc., etc. It contains blank leaves for visiting list, monthly memoranda; addresses of patients, nurses, and their references; accounts asked for; memoranda of wants; obstetric engagements; vaccination engagements; record of births and deaths; cash accounts, etc. It is one of the indispensable books for doctors.

[BOOKS RECEIVED.]

Laboratory Practice, by Prof. Josiah P. Cooke, LL. D. Published by D. Appleton & Co., New York.

Microscopical Diagnosis, by Chas. H. Stowel, M. D., and Lewis Reed Stowel, M. D. Geo. S. Davis, publisher, Detroit.

Taking Cold, by F. H. Bosworth, M. D. Published by Geo. S. Davis, Detroit.

Diarrhea and Dysentery, by Alonzo B. Palmer, M. D., LL. D. Published by Geo. S. Davis, Detroit.

Precis d' Analyse Microbiologique des Eaux, by Dr. Gabriel Roux, Lyon, France. Published by J. B. Boilliere et Fils.

Bacteria and their Products. — By German Sims Woodhead, M. D., London, Walter Scott.

Euzootic Cerebritis, or "Staggers" of Horses, by Prof. N. S. Mays, Manhattan, Kansas.

The Work of Medicine for the Weal of the World, by Prof. C. H. Hughes, St. Louis, Mo.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., DECEMBER, 1891.

RESEARCHES RESPECTING THE PURITY OF VACCINE.[1]

THE director of this laboratory began investigations and experiments in 1887, on the relative purity and activity of the vaccine of commerce. Owing to multiplied duties, he was unable to pursue his work steadily to completion. He carried on various series of investigations at long intervals, in 1887, 1888, 1889, and 1890, at the University of Missouri, and in 1891 at the institution now under his direction. To this date, one hundred and ten specimens of commercial vaccines from twenty different sources have been studied bacteriologically. During these studies, which are still in progress and will be prosecuted more closely than heretofore, there were isolated by culture eight forms of bacteria, which produced, after inoculation, lesions or symptoms of disease more or less pronounced in rabbits, guinea-pigs, rats, mice, cattle, and man, or in several of the species, and seven which produced no lesion or symptom. Among the pathogenic forms were —

Staphylococcus pyogenes,
Staphylococcus pyogenes aureus,
Staphylococcus pyogenes citreus,
Bacillus pyogenes fœtidus,
Bacillus septicus, —

a bacillus which was connected with, and probably the cause of, gangrene; a micrococcus in connection with another case of gangrene; and a saprogenous bacillus in connection with septic lesions.

The last three not identified with known forms, were isolated in 1889, from two different crusts purchased on the market. All of these forms were pathogenic to rabbits, and some of them to certain of the other animals mentioned.

The quantity inoculated varied from 1 to 3 drops of a liquid culture diluted in from two to six or seven drops of distilled sterilized water. Forty rabbits inoculated with these bacteria (7 animals with each kind of the pathogenic germs enumerated above) resulted in 28 local lesions, of which five were nodules more or less pronounced; thirteen were abscesses which healed; ten were abscesses or infectious wounds followed by general infection and death. Nine cases died from septicæemia without local lesions. Only three remained apparently free from symptoms of disease. Among the seven kinds of bacteria which were found in these vaccines, and which proved to be harmless by inoculation, one was the *bacterium termo*, which may, under certain circumstances complicate a wound, though it is not generally considered a parasitic microbe.

A mulatto, vaccinated with a commercial product supposed to be safe, had local septicæmia of a very severe and painful type. Constant local cold-packing reduced it after two days' close attention. A coccus and bacillus existed in the sanius secretion of the angry, deep ulcer that took place at the seat of the pustule. Both these microbes were accidentally lost before any inoculation.

Twenty-six specimens of virus on ivory points, from twelve different sources, purchased in the market, were tested by inoculation to rabbits. Three points of each specimen were wiped with a sterile cloth, soaked from one to three hours in two drams of distilled sterilized water, and ten drops were inoculated hypodermically. The result was, nineteen local swellings, diffused or circumscribed, and four abscesses, one of which caused general infection and death. Three samples proved harmless.

Microscopic analysis of the material inoculated, revealed a degree of purity or impurity in ratio with the symptoms observed. The points offering the smallest number of septic germs produced the slightest lesions, and *vice versa*. Those

[1] This report of progress gives more details and more experiments than that made to the American Health Association at its last meeting in Kansas City.

that produced no lesions at all appeared about free from any foreign microbes.

Four rabbits were tested with twelve half quills. Of these, two produced local swellings, and one an abscess which healed.

Fourteen inoculations made with vaccine from cones or crusts, produced results as follows: Every rabbit had marked swellings, and ten of them had abscesses; of the whole lot, one died within 48 hours, from general infection, and two died after long suppuration.

On the other hand, thirty rabbits were inoculated with vaccine virus, diluted in sterilized water, in which (vaccine) the microscope and cultures indicated the greatest relative degree of purity. The result was a slight enlargement at the point of inoculation in fifty per cent, but there was not a single diffuse swelling, not one abscess, not a death. Possibly the vaccine virus itself produced the slight symptoms observed.

At this stage of our experiments, taking into account extensive observations in several hundred cases of vaccination in man and beast, none of which are recorded here, and from which the writer gathered statistics, we believe that: —

a. Most of commercial vaccines are more or less impure, bacteriologically speaking.

b. Much of it is dangerously contaminated with pathogenic germs.

c. Crusts, scabs, and cones are very impure and wholly unfit for vaccination of human beings.

d. That the extensive inflammatory symptoms, such as diffused reddish or violet swellings, painful or painless œdema; angry or sanious ulcers; lesions with tough, purple, adhering scabs, surrounded by painful enlargement; swellings extending several inches, or even a foot or more away from the point of inoculation, and involving the lymphatics at considerable distance; little abscesses here and there, remote from the spot vaccinated, are so many lesions or symptoms of complication of vaccinia.

e. That such complications are secondary, — the vaccinia cocci preparing the field for the septic forms to grow.

f. That frequently the foreign germs destroy the vaccinia growth in the inoculated spot before the latter has produced its effects, and the patient is left unprotected,[1] and may be vaccinated again successfully or take smallpox.

[1] The writer has seen several cases in which second vaccination took well, after such complications, which doctors had thought typical vaccinia.

g. That the foreign germs found associated with vaccinia cocci are not necessary to produce the true, simple vaccinia pustule.

h. That many doctors mistake marked complications for good vaccinia pustule.

i. That it is possible to produce absolutely safe[1] vaccine by antiseptic and aseptic methods, though extremely difficult to produce vaccine absolutely free from certain air germs.

j. That vaccine from a *second* dipping in the *same* pustule a day or two after the first one, as is done in many commercial institutions, is a bad and dangerous practice, as such vaccine is almost always very impure. (See frontispiece plate.)

HOW TO STERILIZE MILK.

Since the subject of the sterilization of milk has been agitated, the question is often asked, What is the best method of sterilizing milk? that is, destroying the germs of disease or fermentation which it may contain. We have made many experiments, and from our experience can confirm the results of many observers who have given attention to this subject, that the complete sterilization of milk is a matter of no small difficulty. Milk which has been boiled for half an hour once or twice each day for several days in succession, will keep for a number of days, but ultimately sours. This is due to the fact that some of the germs contained in milk are particularly hard to kill, and require a temperature above that of boiling milk.

We have recently been conducting some experiments upon this subject, with results so satisfactory that we are glad to be able to communicate them to the readers of the Bacteriological World and Modern Medicine. The first experiments were made with a tin receptacle capable of resisting a pressure of twenty-five pounds. This was partly filled with water and placed in boiling water, to the action of which it was exposed for half an hour. The pressure indicator showed no very considerable increase in pressure within the closed receptacle. We then tried boiling the tin vessel in a saturated solution of salt in water, when the pressure, as indicated by the pressure gauge, rose to four pounds. This was the result which we expected. We accordingly proceeded to a further experiment, which consisted in boiling milk tightly sealed in

[1] This is done at this Laboratory by scientific methods.

strong bottles, in a saturated solution of salt. Milk sterilized in this way, by boiling in the salt solution for half an hour, will keep perfectly for an indefinite length of time. We opened, a few days ago, a bottle of milk which had thus been sterilized last June (1891), and found it to be as fresh as when placed in the bottle. It is only necessary to take the precaution to allow the solution of salt, in which the bottles are boiled, to cool before removing the bottles. If the bottles are removed from the solution while hot, they will almost instantly burst. The vessel containing the bottles of boiling milk should be set aside and allowed to cool gradually, when the bottles should be removed and placed in an ice chest or an ordinary refrigerator. Ordinary soda-water or beer bottles are excellent for the purpose; or beer bottles may be used. Ordinary corks may be used for the purpose, but they should be previously boiled for half an hour. They should be pressed in tightly, and fastened with wire or with a patent fastener. After the bottles have been cooled and removed from the boiling kettle, the tops should be carefully dried, and if corks are used, covered with sealing wax, such as is ordinarily used for canning purposes.

The efficiency of the salt solution is due to the fact that its boiling point is 227°F., while that of boiling milk is less than 200° F. By using different salts, a still higher temperature may be attained. For example, a saturated solution of carbonate of potash, or saleratus, boils at a temperature of 275° F., while a saturated solution of chloride of calcium boils at 355° F. These high temperatures are, however, unnecessary.

THE BACILLI OF TUBERCULOSIS.

These little rod-shaped parasites vary between 2 and 6 μ[1] in length according to special conditions of their life, and o μ 3 to o μ 5 in width. Their average length is about 3 μ, and the average width about o μ 4. They may be straight, or slightly curved, or irregular in their aspect. They appear either as homogeneous little rods, or as finely dotted bacilli; these dots are due to the presence of fine ovoid or spherical bodies placed end to end like a very minute string of beads. These germs can scarcely be seen without coloring reagents except with high-power lens, and then the dots or spherical bodies, which are looked upon as spores, do not appear. The organisms unstained, particularly if treated with potassa, have the appearance of hyaline, or motionless rods.

The stained bacilli of tuberculosis can be appreciated when magnified 350 to 400 diameters, but it is better to examine them under greater increase, say 480, and it is still better to see them at 700 or even 800 if possible. This high increase is not necessary for diagnosis.

The bacilli may appear shorter or longer in the same specimen, according to their age. For instance, fresh sputum may at first show very fine, short rods. Let it stand a day, or two, and if it does not desiccate, the forms will be found more clearly dotted and longer. After standing for days or weeks, many fine, loose dots — spores doubtless — may be observed, and long bacilli formed by them, disposed end to end. In patients having large lung cavities, the bacilli are sometimes longer, and the loose spores more numerous, than in milder cases.

The quantity of bacilli in sputum, and in all fluids, varies greatly; it depends on the extent and age of the lesions. They are usually much more numerous in extensive cavities than in secretions from small lesions resulting from slight tubercles. A given mount may contain only a few — half a dozen or less — and the next, hundreds.

Sometimes we find bacilli in a large cell, a giant cell, indicating an attempt, perhaps, on the part of nature to destroy the germs by cellular digestion — phagocytosis.

Usually specimens to be analyzed, particularly sputum, contain numerous other germs which have no direct relation to the disease so far as the cause is concerned, but are doubtless very harmful complications; for they must be, as in wounds, dangerous and most potent factors in the destruction of tissue, in producing pus cavities, and in creating very damaging ptomaines.

The good influence of high altitudes on consumptives is due not a little to the fact, I imagine, that pus or decomposition germs are comparatively rare in high altitudes, and complications such as almost always exist in other atmospheric condi-

[1] The μ (mikron), a unit in certain microscopic measurements, means micromillimeter, and is equal to one thousandth of a millimeter. A millimeter is, as the word implies, the one thousandth of a meter, and a meter is equal to 39.37 inches. A millimeter, then, is nearly 1-25 part of an inch, and a μ (mikron) is the 1-1,000 part of 1-25 of an inch.

tions in tubercular lesions opened to the air, find there no destructive agent of the class of ptomaine makers and the like. These foreign germs, in making analysis, can be made to appear unstained at the side of stained tubercle bacilli, or may be stained as the background, and may therefore be readily distinguished.

Tubercle bacilli may be found in sputum, milk, urine, tubercular abscess of the skin, joints, etc., and also in intestinal discharges. In cases of these discharges, one may discover the bacilli in analyzing the coating of the feces, the liquid of an evacuation obtained by a clyster, given a few minutes after a thorough washing of the intestines by careful but extensive enema. At other times it is necessary to analyze much of the fecal matters, and frequently to repeat the operation. Hundreds of other germs may be found in these matters.

The Durability of Apochromatic Lens. — As is well known by microscopists, whatever advantage an apochromatic lens has over the ordinary kind, its durability seemed inferior to the latter. At least it has been the experience of several workers to find themselves with a depreciated, costly lens, which previously did splendid work. The director of this laboratory had this experience with one of Zeiss's apochromatic lenses. Prof. Burrill, of Illinois, in a paper read before the American Society of Microscopists, gives the following experience on the subject: —

"I have now to add a word in regard to the durability of the apochromatic, the want of which has been frequently questioned. After about two years' use it became evident that this lens was in some way impaired, and by looking through it from the back with a magnifier, a hazy-granular appearance was noticeable, not due to dust on the back lens. Last March the objective was sent to the makers for examination and repair. It reached me again in July, as good as new, with the statement that the front lens had been slightly decentered, and that the repair had been easily made, and was without charge. I have no other information upon this point, neither do I know what interpretation to place upon the granular appearance noted. There is certainly nothing of the kind visible now."

TECHNIQUE.

To Extract Ptomaines from Urine. — The necessity of more frequent analysis of urine from a diagnostic standpoint, is made more and more apparent every day. The following is an additional argument in that line :—

In a note to the Academy of Science, Paris, Mr. A. B. Griffiths presents the following method of extracting ptomaines from urine in certain infectious maladies: "A considerable quantity of urine is alkalinized by the addition of a little carbonate of soda, and mixed afterward with half its volume of ether. After deposit and filtration, the ether is shaken with a solution of tartaric acid, which fixes on the ptomaines to form soluble tartrates. After evaporation of the dissolved ether, the acid tartaric solution is again alkalinized by carbonate of soda and shaken with half its volume of ether. This ether solution is allowed to evaporate spontaneously. The ptomaines remain as residue.

"*a. Scarlet Fever:* The ptomaine thus extracted from urine in case of scarlet fever is a white crystalline substance soluble in water, slightly alkaline. It forms a crystallized chlorhydrate and a chloraurate. Phosphomolybdique acid produces a white yellowish precipitate; phosphotungstic acid gives a white precipitate; picric acid, a yellow precipitate. It is also precipitated by Nessler's solution. The chemical formula of this ptomaine is as follows: $C^5H^{12}AzO^4$.

"Pure cultures of micrococcus scarlatina, gave the same ptomaine by Gauthier's method.

"*b. Diphtheria:* The urine of diphtheritic cases is also a white crystalline substance. It gives a chlorhydrate and a chloraurate. Tannic acid precipitates it yellow; phosphomolybdic, white; picric acid, yellow; and Nessler's solution, brown. Formula: $C^{14}H^{17}Az^2O^6$. The bacillus diphtheria No. 2, Klebs and Lœffler, gives the same ptomaine in pure cultures.

"*c.* In a case of congestion of the kidneys, the parotid glands and the sub-maxillary glands, a ptomaine, crystallizing in prismatic white needles, was formed. Formula: $C^6H^{13}Az^3O^2$. It is very poisonous.

"These ptomaines do not exist in normal urine, and are truly formed in the economy under the influence of the maladies mentioned."

BULLETIN OF THE

MEDICAL AND SURGICAL SANITARIUM,

BATTLE CREEK, MICHIGAN.

ANNUAL REPORT OF THE SUPERINTENDENT OF THE BATTLE CREEK SANITARIUM.

To the Stockholders of the Medical and Surgical Sanitarium: —

As doubtless most of you are aware, the Sanitarium, although opened in 1866 and incorporated in 1867, began its real work at its re-organization in 1876. At this time, the institution was placed under a new management; new plans and methods were adopted, a broader and more liberal policy was introduced, and the medical management was placed upon a thoroughly rational and scientific basis.

At the time of its re-organization, the assets of the institution were about $45,000, most of which had been contributed by the friends of the institution and subsequent to its incorporation, as non-dividend paying stock. The stock was issued in twenty-five dollar shares, and was purchased in amounts ranging from one to forty shares, by the friends of the enterprise. The total number of stockholders at the present date is 642.

The purpose of the promoters of this enterprise, as defined in the By-laws, was the treatment of the sick by rational methods and the promotion of sanitary reforms.

At its first organization, it was expected that small dividends would be rendered, but within a year after the incorporation of the institution, the stockholders voted to devote their dividends to charitable and benevolent purposes, the increase of the facilities of the institution, the treatment of the sick poor, the diffusion of sanitary knowledge, etc.

All stock issued since the time referred to has contained a clause equivalent to the above, and all dividends have been used as indicated. It will thus appear that the institution is simply a self-supporting charitable enterprise. All officers, managers, and other persons connected with the institution, are employed upon moderate salaries. Not a single dollar of the earnings of the institution has ever been distributed to stockholders, or to any other persons, except to objects of charity. Each year a portion of the earnings of the institution has been devoted to improvements, repairs, etc., and as large a sum as possible has been appropriated annually to the charitable treatment of the sick poor. This feature of the institution has steadily increased from year to year within the last fifteen years, until, in the last year, from Oct. 1, 1890, to Oct. 1, 1891, a total of more than $32,000 was reached. This sum includes not only those cases treated in the Sanitarium proper, but also expenses incurred in the support of free beds in the Sanitarium hospital. The amount expended during the last year in this way was somewhat injudiciously large, as it left nothing from the net earnings for repairs and improvements; nevertheless, it is hoped that by the exercise of greater economy in some departments, the same or nearly as large an amount may be expended during the coming year. In fact, the plans which the managers have made with reference to charity treatment for the year to come are considerably more liberal than for the year past. The conditions upon which charity patients are received, are chiefly as follows: —

1. Only worthy, indigent, and friendless persons will be received as free patients.

2. No one will be admitted without proper credentials and recommendations.

3. No one will be admitted for more than three months at a time, and each month the Medical Superintendent in charge shall examine the patients with reference to the propriety or necessity of their prolonged stay, and shall sign a statement of the patients' condition, with a recommendation.

4. Each patient must deposit, on entering the hospital, a sum sufficient to defray his expenses home, and also sign an agreement to leave the institution when requested to do so by the Board of Managers.

5. Incurable persons will not be received, or if received, will not be retained.

6. Insane persons, epileptics, and patients with offensive, loathsome, or contagious diseases, will not be received.

7. Persons wishing to enter the hospital must make arrangement by correspondence beforehand.

The total number of patients who have been made the recipients of charitable treatment during the last two years, has been 837. This is, of course, a much smaller number than is treated gratuitously at many hospitals, but it should be remembered that the institution has no source of income whatever except from its own earnings, and consequently its charitable work must be, to a degree, limited. It should also be taken into consideration that the expense of caring for patients in a Sanitarium is very much greater than for hospital cases. A few items of expense will make this point clear: The number of employees in the institution, during the last two years, has varied from 325 to 365. As stated above, the salaries are small, and yet the total sum is by no means inconsiderable, amounting, for the last two years, to $115,657.62. During the greater part of the year, the milk supply of the institution amounts to from ten to twelve hundred quarts daily. The expense for fuel during the cold season, is from forty

to fifty dollars daily. The expense of maintaining a large and extensive electric lighting plant is not small; and even the water bill, although the water rates are moderately low, amounts to a considerable sum, with a consumption of from 30,000 to 60,000 gallons of water daily.

At the time of its re-organization, the outfit of the whole establishment consisted of one small two-story wooden building called the Main building, which was capable of accommodating about twenty patients, and a half dozen cottages. At the present time, the buildings of the institution consist of a large Main building, a Hospital, an Annex, and twenty cottages and other buildings. The main building is 312 feet in length, with a rear extension of 100 feet, and is five and six stories in height, above the basement. The hospital building is 100 x 60 feet, five stories high.

The construction of the new brick veneer main building was begun in 1877, and completed in 1878. This building was capable of accommodating about 150 patients. In 1884 a five-story addition was erected at the south end of the main building. In 1888 a hospital accommodating 150 beds was erected a few rods north of the main building; and in 1890, the main building was raised one story in height, and a six-story addition erected at its north end.

The present buildings of the institution are capable of accommodating from four hundred to five hundred patients. During the greater part of the year, not only the entire buildings of the institution are occupied, but several hired cottages as well. There are few vacant rooms at any time.

In the erection of the buildings of the institution, care has been taken to secure the very best possible sanitary conditions. All sewers are connected with large smoke-stacks, so that any sewer-gas which may be generated is consumed. Openings into the sewers are so placed as to furnish to them a constant supply of fresh air, so that with the strong draft secured by the connection of the sewers with the smoke-stacks, the most thorough ventilation is constantly maintained, making contamination of the house air by sewer-gas impossible. There is, however, no plumbing in connection with private rooms or wards. Water-closets of the most approved pattern are placed with reference to isolation and the prevention of contamination.

The system of ventilation is somewhat unique for a building of this size. By means of large openings in the basement, which, in the main building aggregate 50 square feet in sectional area, pure air is admitted directly from out-of-doors, and passed through immense heaters by which it is warmed to a proper temperature, which is maintained at 70° F. for the day time, and 60° F. during the night. This air is carried by large ducts to the several halls, being introduced at different points, so as to secure perfect distribution. The halls are thus kept constantly filled with a volume of pure air. Each room is supplied with an independent ventilating duct, the opening of which is placed beneath a window, the coldest place in a room, and the point to which the foul air naturally gravitates. The duct is carried up in the inside walls, so as to secure constancy of action and independent discharge, above the roof of the building. The duct for each room has sufficient capacity to supply 3,000 cubic feet of air per hour for each of five persons, the air traveling at the rate of five feet per second. As rooms with one duct are rarely occupied by more than one person, it is apparent that an amply sufficient supply of fresh air is secured for each individual.

As the result of many examinations with the anemometer, the supply of air is found to be from 10,000 to 15,000 cubic feet per hour for each patient. This secures such a degree of purity that odors are never discoverable in the establishment. Even in the hospital, the odors of iodoform, carbolic acid, and other antiseptics are never met in the halls,—nor anywhere, in fact, except in connection with their immediate use. The air of individual rooms never intermingles, in consequence of the arrangement of the ventilating apparatus. There is a continued forward march of the air current from the supplying-ducts into the halls, from the halls through open transoms into the individual rooms, and thence through the ventilating ducts directly out-of-doors. The placing of the ducts in the inside walls secures a sufficient degree of warmth, so that back currents do not occur.

The automatic distribution of pure warm air operates with certainty and efficiency during the whole year, when doors and windows are necessarily kept closed in consequence of low external temperature.

Large openings are arranged at the ends of each hall, so that in case of excessive warmth at any time, the temperature of the halls can be brought down to a desired point within a few minutes; but any considerable variation of temperature does not occur, as a competent person has assigned to him, as his duty, the inspection every hour, and recording of the temperature of each hall and all public rooms of the establishment, as well as the external temperature and the temperature in the hot-air chambers.

The excessive dryness of the air, usually so noticeable in extremely cold weather, is corrected by means of numerous steam jets, so placed in the hot-air chamber as to render it possible to secure any degree of saturation with moisture required. The condition of the air as regards moisture is observed each hour by means of hygrometers, and recorded.

The heating of certain rooms is so arranged that a higher or lower degree of water saturation may be secured, if desired, for adaptation to the wants of pulmonary or renal disease.

The fresh-air inlets are provided with means for cooling the air, so that in case of excessive heat in summer-time, a thing which rarely occurs in Michigan, the air brought into the building may be lowered from eight to ten degrees below the external temperature. In the last thirteen years it has been necessary to bring this apparatus into operation only on two or

three days, during the excessively hot summer of 1886, when such an extreme degree of heat prevailed everywhere.

Both safety and air purity are promoted by the exclusive employment of the Edison incandescent system of electric lighting for illuminating purposes; the same current also furnishes an ample source of electricity for surgical and medical uses.

The institution is organized into departments, each being under competent management, the principal ones among which are the following, aside from those exclusively concerned with the domestic work of the institution:—

The Department of Hydrotherapy. — An extensive suite of apartments complete for both ladies and gentlemen, furnishes facilities for every useful form of hydrotherapeutic appliance. These means are employed by the aid of attendants who have been thoroughly trained for their work. In addition to ordinary hydrotherapeutic measures, facilities are furnished for Turkish, Russian, and electrical and electric-light baths.

The Department of Massotherapy. — This department, which employs a score of well-trained manipulators, employs every form of massage, Swedish movements, both passive and active-passive, and mechanical massage. Closely connected with this department is —

The Gymnasium, a room capable of accommodating several hundred, in which is to be found every appliance suitable for the use of invalids, as aids to exercise. In addition, patients are trained daily in Swedish gymnastics both medical and pedagogic, Delsarte, calisthenics, and various other forms of exercise. Preparatory to work in the gymnasium, each patient is subjected to a careful test of all the principal groups of muscles in the body, the results being recorded upon a chart, after the graphic method, so that each individual's weak points are at once apparent. By this chart, a careful exercise prescription is prepared, in which the patient is instructed and supervised in daily carrying out. Improvement of physical strength under this training is often marvelous, patients not infrequently doubling their total muscular capacity within a month. Careful measurements of the body are also taken for the purpose of detecting deformities or lack of symmetry. The results of these tests and measurements often give most important therapeutic indications in addition to the information which they convey respecting the needs of the individual as regards muscular exercise.

The Department of Electrotherapy. — This department is provided with the most efficient appliances known for the use of electricity in all its useful forms: Galvanic, Faradic, dynamic, and static currents are ready to be drawn upon for appropriate cases, in any quantity desired, from a current adapted to a diseased eye or to the destruction of a hair, to the heavy current required for the treatment of tumors. The same careful, pains-taking accuracy is used in the employment of the electric current, as is used by a skilled pharmacist in the preparation of his medicinal prescriptions.

Department for Mental Diseases. — Persons suffering from mental disorders of a pronounced character, are cared for in a pleasant home specially fitted up for the purpose, located on the Sanitarium farm within sight of the Sanitarium and about half a mile distant. The home is connected with the Sanitarium by telephone, and is furnished with every necessary appliance for the proper treatment of this class of patients. Patients here have the advantages of quiet, seclusion, and homelike conditions, and are not allowed other associations than those of persons who are well, and whose influence over them will be wholesome. Kind nurses, special attendants, pleasant surroundings, and the same careful regimen, hygienic and other treatment which any nervous invalid would receive, accomplish for this class of persons results which are not ordinarily attained in public asylums, or even in private institutions where a large number of insane persons are more or less indiscriminately associated together, and where the important advantages of the scientific application of massage, electricity, physical training, and allied measures of physiological treatment are not ordinarily secured.

Dietetics. — This department, while not entirely distinct, still sustains so important a relation to the work of the institution that it should be mentioned. It consists essentially of an experimental kitchen, a cooking-school, an extensive diet-kitchen, and a series of diet-tables at which patients can obtain any article of food which his physician may consider indicated in his case. The diet prescription of each patient is prepared with the same care as is required in medicinal, exercise, or other prescriptions. Preparatory to giving diet prescriptions, a careful chemical examination in each case is made of the secretions, and a rational foundation is found on which to base directions for thedietary. This department is so systematized that the patient is supplied with a variety of foods suitable to his case, without ever being at a loss to know what to select, so that he is relieved from the necessity of engaging in that dyspepsia-producing occupation in which so many patients suffering from stomach disorders often spend a considerable part of their time; viz., introspection of the stomach, and conjecturing as to the compatibility or incompatibility of the various articles of food swallowed, with one another or with the stomach.

Surgical Department. — While this is not the most prominent feature of the institution, it still deserves notice. The Sanitarium hospital accommodates from 100 to 150 beds, and is unquestionably one of the finest structures of its size in the country, and is well adapted to the purposes for which it was constructed, there being but three or four wards in the hospital capable of containing more than three or four beds each. By this means that quiet is secured to the patient which is so invaluable in the majority of surgical cases until convalescence is established. As soon as patients are able to do so, they meet socially in the sitting-rooms and parlors of the

hospital by the aid of the wheel-chairs, though still at all times under the supervision of their nurses, the matron, or the house physician.

The hospital has a fine operating-room and a complete outfit of sterilizing apparatus for dressings, clothing, etc., and every useful surgical appliance. No public clinics are held, but physicians sending patients are of course always welcome to be present at operations, and visiting physicians are always courteously treated.

The most radical aseptic measures are employed in connection with all surgical operations, and as the result, a very low rate of mortality is maintained. Within the last two years, a record has been made of 52 ovariotomies without a death, and 100 consecutive cases with only three deaths.

The physicians of the institution appeal to surgical measures as seldom as possible; and it is found that the varied appliances of the institution render it possible to cure many cases which have been pronounced incurable, without surgical means. No case is subjected to a surgical operation before a thorough trial of non-surgical measures has been made, unless the history of the case shows that such measures have been previously employed for so great length of time that further trial is useless. This remark is made to correct the popular notion that surgery is the favorite and almost exclusive method of any institution of the nature of a hospital. The Sanitarium hospital is, comparatively, a recent addition to the department of the institution, and was only added to render it possible to deal exclusively with a class of cases which have been refractory to all forms of non-surgical measures of treatment. The expectations of the managers that in the establishment of a hospital, a better than ordinary surgical record would be made by the combination of Sanitarium treatment and regimen, in the preparation and after-care of patients, with the most advanced methods of modern surgery, have been more than realized, as already indicated, by the low rate of mortality secured in a long succession of critical cases.

Nurses' Training-school.— For the last seven years, it has been found necessary to maintain a nurses' training-school, for the purpose of supplying the institution with trained nurses. Several hundred nurses have been trained in this school, many of whom are now practicing their profession in various parts of the United States. The number of students in the school varies from 70 to 100, at different seasons of the year. The aids afforded by this school for the acquirement of a knowledge of medical and surgical nursing have rendered the school so popular that the number of applicants has for a long time been greater than could be received. At the present time, there are several hundred names of applicants on file, awaiting their opportunity to get into the school. There has recently arisen a demand for nurses trained after the methods of the Sanitarium training-school for foreign mission work, and the importance of this line of philanthropic work seemed to be so much in harmony with the character of the work of the institution, that the managers have thought it best to give this class preference over others, so that at the present time, almost the entire class, numbering some 60 members, are pledged to medical missionary work in some needy field. In this school each nurse is not only instructed in the bedside care of the sick, in surgical nursing, monthly nursing (for young women), but also in the work carried on in all the different departments of the institution. Each also receives thorough instruction in the science of cookery, and especially cookery for the sick, in medical dietetics, and in dietetics in general. The course requires two years of study, and a post-graduate course is provided for nurses who wish to continue their studies further.

The Laboratory of Hygiene.— This, one of the latest additions to the institution, has been established within the last two years, and put upon a thoroughly satisfactory and permanent basis within the last six months. The director of the laboratory, Dr. Paul Paquin, recently Professor of Bacteriology in the State University of Missouri, aud State Veterinarian for that State, is considered a rarely competent man for the place. The laboratory has a number of departments which are devoted, respectively, to bacteriology, physiology, chemistry, pathology, and lastly, a vaccine laboratory in which is undertaken the preparation of vaccine absolutely free from the pathogenic microbes which are found very abundantly in the different brands of vaccine which are in common use at the present time.

Preparatory Medical School.— In addition to the other departments, there has been established within the last two years, in connection with the institution, a preparatory medical school in which young men and women are received who are preparing themselves for medical missionary work in foreign lands. Several such persons (the present number is nearly 20) who have pursued a medical course in the preparatory school at the Sanitarium, are now continuing their studies by the aid of pecuniary assistance furnished by the institution, at leading medical schools. All these persons are pledged to enter upon work as medical missionaries for a period of not less than five years after their graduation. From the interest shown by the individual members of the class, we have reason to hope that each one will make this line of philanthropic effort his life work.

The Physicians.— The present number of physicians employed in the institution is nine, most of whom have had from five to twenty years' experience in connection with the establishment, in addition to a thorough education in the best under-graduate and post-graduate medical schools, and so are well prepared for work in their several lines.

(*To be continued next month.*)



MORPHOLOGY OF THE YEAST-PLANT.

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

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ORIGINAL ARTICLES.

INFLUENCE OF THE CONTINUOUS CURRENT ON MICROBES, PARTICULARLY ON CHARBON BACTERIDIA.

BY M. M. APOSTOLI AND LAGUERRIERE, OF PARIS.

(Continued.)

Thirty-eighth Series (February 15, 1890), Blue Pus. Tube No. 3.[1]

A CURRENT of 200 milliamperes, applied 5 minutes on cultures of blue pus, did not give appreciable results.

Thirty-ninth Series (February 20, 1890), Charbon. Tubes No. 2 and No. 3.

1. A current of 200 milliamperes (tube No. 2), applied 5 minutes, attenuated the bacteridian virus; six drops of culture inoculated before the application killed the guinea-pig, but did not kill the rabbit; six drops injected after the application did not kill the guinea-pig.

2. Two rabbits were inoculated with charbon virus, furnished us by Mr. Roux, of the Pasteur Institute, and succumbed in about thirty-six hours.

3. The cultures were submitted 5 minutes to a current of 200 milliamperes in apparatus No. 3.

Two rabbits inoculated with the positive tube (six drops) remained refractory; the cultures sown with the same tube remained sterile. Two rabbits inoculated with six drops of the negative tube died the 23rd of February; the sowing done with the same tube succeeded.

Two rabbits inoculated with six drops of the interpolary tubes died in the night of the 22nd to the 23rd; that is to say, later than the witness-rabbits, and a little sooner than the rabbits inoculated with the negative tube; the sowing done with interpolary tubes succeeded.

[1] See plates of the tubes and apparatus in Nov. number.

The reactions obtained with litmus paper in this experiment and in consecutive experiments were as follows:—

1. At the positive pole the blue paper turned red.

2. At the negative pole the red paper turned blue.

3. At the central positive tube the blue paper became red.

4. At the central negative tube red paper turned blue.

After forty-eight hours, the apparatus having remained in place, the reactions with the litmus paper were sensibly the same; which shows how slowly is effected the diffusion in liquids during a state of rest.

Fortieth Series (February 25, 1890), Charbon.

1. The two rabbits inoculated with positive tubes in the preceding experiment, received two drops of virulent charbon. One died the morning of the 28th, and the other the first of March.

2. A guinea-pig having resisted the inoculation with attenuated virus the 20th of February, was inoculated with one drop of virulent charbon, and died in the night of the 27th.

Forty-first Series (March 6, 1890), Charbon. Apparatus No. 3.

The four tubes of apparatus No. 3 were isolated by intercalary stoppers of sterilized gelosine, as was also the entire apparatus.

N. B.— Through forgetfulness, which we regret, the tubes of cultures were not mixed before their distribution in the apparatus.

Of two rabbits inoculated with ten drops of the culture of charbon, one died of charbon; as to the second, the result was doubtful.

Application of 5 minutes of a current of 100 milliamperes on the cultures.

Ten drops previously separated in the positive tube did not kill the rabbits. Ten drops of the negative tube, and even of the central negative tube, killed rabbits and guinea-pigs. The sowing done with

abstractions from each of the tubes succeeded, but much later in the central positive tube than in the other tubes.

Forty-second Series (March 9, 1890), Charbon.

Inoculations and abstractions made with cultures resulting from the product of tubes which had felt the effect of the passage of the current in the previous experiments, demonstrated once more that attenuated charbon may be the origin of more attenuated charbon.

Forty-third Series (March 12, 1890), Charbon.

With the contents of small pipettes, comprising the extractions made the 6th of March in the different tubes of apparatus No. 3, inoculations were made on rabbits.

Inoculations made with the virus which had not been subjected to the current, produced death; inoculations made with the different tubes of the apparatus subjected to the current, gave a negative result. This is logical for the positive tube, and is explained in relation to the other tubes by a purely spontaneous attenuation, the apparatus being left exposed to the action of the light.

Forty-fourth Series (March 16, 1890), Charbon. Apparatus No. 3.

1. The different tubes of culture were mixed in a sterilized Chamberland pipette; the mixture was then distributed in apparatus No. 3, whose inferior central part was filled with sterilized gelosine.

Apparatus placed in ice; 12° C. at the positive pole and at the negative pole.

Application of a current of 60 milliamperes 5 minutes.

Before the distribution of the cultures, two rabbits received ten drops of the mixture, and remained indifferent.

After the passage of the current: Ten drops of the positive tube killed two rabbits in four days. Ten drops of the negative tube killed one rabbit in three days, out of two that had been inoculated. Ten drops of the central positive tube killed one inoculated rabbit in five days. Ten drops of the central positive tube did not kill one inoculated rabbit.

2. Apparatus No. 3 received a new distribution of charbon, and was then subjected to a current of 60 milliamperes 30 minutes.

After the passage of the current: Ten drops of the positive tube used in inoculating two rabbits caused the death of one the fourth day; that of the other, the fifth day. Ten drops of the negative tube used to inoculate two rabbits, left them indifferent.

N. B.— From which we conclude that a current of feeble intensity would revivify the virulence of the positive pole in the liquid of culture naturally attenuated.

Forty-fifth Series (March 26, 1890), Charbon. Apparatus No. 3.

1. Mixture of cultures; previous inoculation of ten drops of this mixture on two rabbits had caused death March 28 and 29.

Apparatus No. 3 with gelosine in the central part, was placed in pounded ice. Current of 50 milliamperes five minutes.

After the passage of the current: Ten drops of the positive tube killed two guinea-pigs in forty-eight and seventy-two hours.

N. B.— From which it is apparent that the influence of the current with feeble dose had been vivified instead of attenuated.

2. With new distribution of the same culture in apparatus No. 3; action of a constant current of 200 milliamperes five minutes.

After the passage of the current: Ten drops of the positive tube did not affect three guinea-pigs inoculated.

Ten drops of the negative tube killed three guinea-pigs; two in forty-eight hours; the third in seventy-two hours.

N. B.— The influence of the current with a strong dose had manifestly been attenuated at the positive pole.

Forty-sixth Series (May 20, 1890,) Charbon. Apparatus No. 3.

With dog-charbon furnished by M. Malm, of the Pasteur Institute, broth sown seventy-two hours before and inoculated in a dose of ten drops, left two rabbits indifferent, which was owing to an insufficient virulence.

A thread of magnesium, rolled upon itself several times, is substituted for the electrode of platinum at the end of the positive pole.

Application of a current of 160 milliamperes 10 minutes.

After the passage of the current: The blue litmus paper assumed a bluer tinge at the positive pole than at the negative pole.

Ten drops of virus drawn from the bottom or toward the top of the positive tube killed two rabbits, and six drops killed four guinea-pigs.

Six drops of the negative tube killed two guinea-pigs.

A benign virus was therefore transformed into a deadly virus under the influence of the small quantity of oxygen that remained unemployed, the greater part of

it having united with the aluminum during the gradual process of its formation.

In this experiment, hydrogen itself, like oxygen, used in small doses, would seem to increase the virulence of pathogenic organisms.

Forty-seventh Series (May 29, 1890), Staphylococcus Pyogenes Aureus.

Five divisions of Strauss syringe containing a fresh culture of the staphylococcus pyogenes aureus were inoculated in two rabbits.

Vast abscesses, a large mortification of the skin in the region inoculated, and the emaciation of the animals, were the results of the operation. Six weeks later, the animals were not yet restored.

Forty-eighth Series (June 8, 1890), Staphylococcus Pyogenes Aureus. Apparatus No. 3.

Distribution of a mixture of cultures in apparatus No. 3, whose central part is partitioned with gelosine, and whose electrodes are recovered with an intermediary layer of gelosine.

1. The tubes of broth were sown with success.

2. Fifteen drops of mixture were inoculated in two rabbits. Positive result: Tumefaction, abscess, gangrenous ophacelus at the point inoculated.

3. Current of 250 milliamperes, 10 minutes.

The sowings consecutive to this application were positive.

Fifteen drops of the positive tube and as many of the negative succeeded more or less, according to the subjects inoculated.

N. B.— In this experiment, the stoppers of gelosine which surrounded the electrodes and separated them from the broth of culture, prevented the action on this broth from the products of electrolysis, and, consequently, prevented all attenuation.

4. A current of 500 milliamperes applied 6 minutes on a new distribution of the same culture, caused an elevation of the temperature from 11 to 31°C. at the positive tube, and from 11 to 24°C., only, at the negative tube.

The inoculations (fifteen drops), on rabbits remained negative with the positive tube, and positive at the negative pole.

N. B.— In this last experiment, we had not kept the stoppers of gelosine in contact with the poles; and this accounts for our obtaining a positive answer.

Forty-ninth Series (June 10, 1890), Rabbit Pus. Apparatus No. 3.

Pus of an abscess formed by an experiment on a rabbit was sown on peptonized broth.

1. Fifteen drops of this culture inoculated in two rabbits produced tumefaction, abscess, gangrene at the seat of the operation, emaciation, and finally the death of one of the animals.

2. Current of 250 milliamperes, 10 minutes, with ice and without stoppers of gelosine on the electrodes.

Fifteen drops of the positive tube gave an absolute negative result on two rabbits.

Fifteen drops of the negative tube produced the same local effects as on rabbits inoculated before the passage of the current.

3. Current of 500 milliamperes, 5 minutes, on the same media of culture, introduced in the same apparatus. The positive thermometer rose to 42°C., the negative to 40°C.

Fifteen drops of the positive tube produced no result.

Fifteen drops of the negative tube produced precisely the same effects on the rabbit as those obtained with virus not subjected to the current.

The broth sown with the positive tube remained sterile.

The broth sown with the negative tube vegetated very rapidly.

Fiftieth Series (June 20, 1890), Dog Charbon. Apparatus No. 3.

1. Fifteen drops of culture caused the death of two rabbits. One died the 26th of June, the other, the 28th.

2. Application of a current of 300 milliamperes, 3 minutes, with electrodes of platinum. After the application: Fifteen drops of the positive tube were inoculated in two rabbits; one died the 23rd, the other the 25th, in the morning.

Fifteen drops of the negative tube were inoculated in two rabbits; one died the 25th of June, the other, the 28th.

N. B.—The dose of 300 milliamperes applied 3 minutes, is therefore insufficient, so far as the duration is concerned.

Moreover, the rabbits inoculated with the positive tube died first, which goes to show that *oxygen exalts the virulence of a media of culture instead of lessening it*, if the current is not applied at least *five minutes*.

Dr. Simolton, of California, in a recent paper, calls attention to the fact that the nose is not in the middle of the face.

THE APPLICATION OF THE MICROSCOPE IN MEDICAL, MEDICO-LEGAL, AND LEGAL DIFFICULTIES.[1]

BY FREDERICK GAERTNER, A. M., M. D.,
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SINCE the introduction of microscopy as a study and a method of examination and research, and especially since its application in medical, medico-legal, and legal difficulties, science may be considered nearly complete.

A microscopist, who has not mastered microscopy in all its details is certainly incompetent and unreliable in his examinations. The competency and reliability of such a scientist are of especial importance when expert testimony is required at court, where the life of a fellow-citizen may be involved in cases of indictment for murder, rape, infanticide, and criminal abortion. This reliability is of scarcely less importance in cases of malpractice suits, suits for damages, cases of forgery, the adulteration of food and drink, the mutilation of legal documents, etc. This testimony may establish the genuineness of legal documents and discover counterfeit currency. All similar secret criminalities can be revealed and indubitably established by the agency of that wonderful instrument, the microscope. Until from about ten to fifteen years ago, the commonwealth in prosecution of criminals, especially in cases of murder, would select and *subpœna* the best medical experts, who would give their experience and observation under similar circumstances.

Now the commonwealth ignores such testimony and seeks the most learned specialists, *i. e.*, an expert microscopist, and bids him make a thorough, scientific investigation, including microscopical, micro-chemical, and chemical examinations of the subject before him. His testimony is then given before an intelligent jury, and thus the indicted person may be justly cleared, or justly convicted by facts which would otherwise never have been revealed.

If a physician has love for his profession, he cannot fail, if he needs its use, to have the greatest possible interest in the study and application of the microscope. The man who has made microscopy a part of his profession will soon find his scientific and microscopical services in demand both for investigation and research in the advancement of science and art, and for the enlightenment of medical, medico-legal, and legal difficulties.

More than a mere knowledge of medico-legal principles, more than talent or even genius, is requisite for the scientific practice of microscopy. The young man who is eager to begin at the very top of the ladder to study medico-legal microscopy (and all young men are eager), soon discovers that it is the part of wisdom to go slowly, that creeping comes before walking, and that after all there is something not to be found in medical, legal, and microscopic books, nor to be learned from the lips of a preceptor or mentor, and that this something is nothing else than experience. Experience is the essential factor in the solution of the complex and intricate problems which present themselves to the practiced scientist and expert microscopist.

Indeed, it seems that every one should know to some degree the use and application of the microscope, and the grocer, butcher, and farmer in particular should make themselves acquainted with its workings and manipulations. The physician simply *must* be a microscopist or be comparatively incompetent and unable to arrive at a positive or correct conclusion in diagnosing and prognosing many cases.

No man should make microscopy a profession unless he has a genuine love for it. It is generally true that men are successful only in those callings or pursuits to which they are inclined, and in which they continue from choice; and I think this is especially true in regard to the study of microscopy. Success therein means hard work, even under the most favorable circumstances, and oftentimes, indeed almost always, a long probation.

In my opinion, microscopy should be made a compulsory study in all universities and colleges, particularly medical colleges; and even in high schools its fundamental branches should be taught. Microscopy is certainly of paramount importance to the pharmaceutist (druggist), chemist, botanist, and geologist, as well as to the physician.

In European universities every student must have completed three semesters in microscopy before he can become a candidate for his final examination. I think the proper authorities should make microscopy a compulsory study in all higher grade schools, and especially medical colleges, and should encourage microscopical re-

1 Read before the Pittsburg Academy of Science and Art.

searches and investigations just as England, Germany, Austria, and France have done during the past decade. Microscopists abroad have been encouraged by the offer of capital prizes, honorary medals, etc., etc.

If it is a wise provision of our Government to enact laws for the benefit and protection of commerce, it would be still wiser and nobler to provide laws for the advancement of science and art, and for the protection of humanity against diseases which in our country are due largely to the adulteration of food and drink, and the accumulation of micro-organisms in them.

MEDICAL MICROSCOPY.

The microscope, applied in the study of medicine, can no longer be considered an accessory but has become a necessary and highly important factor.

Microscopy is to the science of medicine what the alphabet is to reading. It has not only elevated medicine to a science, but has also thoroughly investigated and developed anatomy, histology, physiology, embryology, pathology, bacteriology, botany, etc., which constitute the science of medicine and surgery.

Without the microscope the medical profession or the scientific physician, would be at a loss in the discrimination of diseases. The physician would be unable to distinguish between diseases related in various ways or apparently alike, with anything like certainty, and would thus be compelled to follow the example of old-time physicians, and treat the symptoms instead of the disease proper, as the scientific physician now understands how to do. For example, in the case of a man suffering from icterus generalis (Gelbsucht), commonly called jaundice, the old-timer would immediately, upon arriving at the bedside, diagnose jaundice and treat the symptoms instead of the disease proper, the pathological condition. Now a physician would invariably endeavor to treat the causes of jaundice which would be one of the four distinct and different pathological conditions, either that of—

1. Gastro-duodinitis acuta.
2. Occlusion of the ductus communis choledochus.
3. Hepatitis interstitialis racens, including degenerations and atrophies.
4. Carcinoma hepatis and carcinoma duct. biliferorum.

The scientific physician would no more think of treating jaundice (the symptom) than he would treat the headache of a person suffering from typhoid or scarlet fever, or the polluted breath (fetor) of one suffering from diphtheria, or the urine of one suffering from Bright's disease, technically called nephritis. He would instantly resort to the microscope to find the cause, *i. e.*, the pathological condition, the abnormal physiological functions, before basing his etiological conclusion. If the patient were vomiting, he would examine the vomits microscopically and chemically, and thus find a more rational indication, determining at an early date, possibly, whether or not the patient was suffering from cancer of the stomach.

By a microscopical examination of the sputum, especially by the staining methods of Koch, Erlich, Weigert, Friedlander, and others, he would at once be able to state whether or not the disease was tuberculosis.

Consider the importance of the microscope in the analysis of tumors. By its use the physician may readily distinguish between the heterologous types of tumors, epithelial growths, commonly called cancerous, and other analogous sorts, not epithelial but fibro-plastic growths, which we denominate sarcomatous. Both are of a most malignant character, and stand in contradistinction to non-malignant types of tumors or growths. The greatest success of a surgeon depends upon his distinguishing malignant from non-malignant tumors at an early date, and being able to make the excision in due time, and thus save the patient's life.

The invention of the microscope was certainly a boon to mankind, since it is one of the chief aids of physicians. A physician without a microscope is almost like a man without eyes; he is unprotected and uncertain, and must be considered incompetent, simply because he cannot see as far as the scientific physician who sees by the aid of the microscope.

Without the improved microscope the great French chemist and bacteriologist, Pasteur, would never have discovered the process of fermentation, and his bacteriological researches would scarcely have been begun; but by its aid he has proved without a doubt that all infectious diseases are due to microbes, commonly called germs.

Prof. Koch, the world's most renowned bacteriologist, by means of that wonderful instrument, the microscope, has revealed to us scientific means by which it is anticipated that tuberculosis may be diagnosed and cured in the near future.

Medico-Legal Microscopy.

This is certainly a broad field, and much remains for future investigation, research, and observation.

The physician must be, and the attorney should be, a microscopist. Everything that concerns a medical examination in a legal sense or a legal examination in a medical sense, may be enlightened and accurately determined by the use of the micro scope. Here are to be understood the previously mentioned cases of homicide, infanticide, rape, criminal abortions, malpractice suits, suits involving the adulteration and imitation of food and drink, etc.

Within the last decade, scientists have shown the possibility of determining old and dried human blood spots from those made by the blood of the lower animals. It is comparatively easy for a microscopist to distinguish with certainty the blood of amphibious animals and fishes, but it is a decidedly different matter to distinguish human blood from that of the higher order of animals.

Scientists, namely Bizzozzero, Cantani, Friedlander, and others have demonstrated the possibility of often distinguishing dried and old human blood spots from those of animals, whether found upon wood, iron, cloth, or other substance.

Histologists and pathologists have demonstrated the great value of the microscope in distinguishing the skin, hair, brain matter, and even the excretions and secretions of the human being from those of the lower animals. Moreover, expert microscopists have pointed out that the blood which circulates through our arteries and veins might be so contaminated with constitutional diseases, such as septicæmia, leukæmia, and certain fevers, that it would be possible to determine accurately and even beforehand, the severity of the disease, to give a correct diagnosis and prognosis, and to make a clear differentiation of diseases.

How else than by the microscope could such marvelous feats be accomplished? What a safeguard is such power in the above-mentioned cases!

Were it not for the microscope, it would sometimes be an impossibility for a physician to state with certainty that upon a certain female, rape had been committed; this decision is a very difficult one, and can occasionally be determined accurately and positively only upon the finding of certain microscopic characteristics, such as the finding of spermatozoa, spermatic crystals (Charcots), etc., upon or about the vagina or its surroundings, such as dresses, night-shirts, or drawers.

In cases of infanticide it is frequently necessary to prove by scientific methods whether or not the infant child has breathed. Cast a piece of lung tissue into a vessel containing water, and by its floating or sinking alone decide whether the child had breathed or not. This is the old and unreliable method. The microscope affords a much more reliable proof.

Under the microscope, a section of the lung tissue of a child that has breathed presents the following genuine characteristics: —

1. The lung tissue presents the appearance of being expanded, that is, the alveoli are expanded and contain air, mucus, and loose epithelial cells.

2. The epithelial cells lining the alveolar walls are flattened.

3. The blood in the arteries is positively oxygenized, aërated-arterial blood.

In contradistinction to this, the lung tissue of a child that has not yet breathed reveals under the microscope the appearance of real and as yet embryonic lung tissue.

1. The lung tissue is shown to be as yet in a collapsed condition, and to contain neither air, mucus, nor flattened epithelial cells.

2. The alveolar walls are lined with a well-developed and as yet distinct round cell epithelium.

3. The blood in the arteries is shown to be venous blood.

The microscope again solves medico-legal difficulties in cases of malpractice suits, etc., by analyzing food, drink, drugs, etc.

1. It may detect the slightest adulteration, as well as an imitation.

2. It may determine whether or not the article is spoiled or has undergone any degree of fermentation.

3. It may reveal any accumulation or development of micro-organisms. Thus scarcely an adulterated drug, meat, or oleomargarine can keep its secret when placed under the microscope.

(To be Continued.)

Experiments which have been conducted by M. Herbert, a French physician, show that bromide of potash when used for some time accumulates in the tissues, especially in the cartilages and the bones. M. Richert reported having made the same observation respecting the kidneys.

THE INFLUENCE OF DRESS IN PRODUCING THE PHYSICAL DECADENCE OF AMERICAN WOMEN.

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(Continued.)

THE proper action of the chest may be aptly compared to that of a pair of bellows. The lower ribs, to which the strong breathing muscles are attached, serve as the handles. The breathing apparatus of a woman whose waist is constricted by a corset or tight bands, is nearly as much embarrassed in its action as would be a pair of bellows with the handles tied together. The clavicular respiration, so conspicuous in women who constrict the waist, is not seen among savage women, nor in a woman whose respiratory organs have not been restricted in their action by improper clothing. That this mode of breathing is abnormal might be fairly inferred from the structure of the upper part of the chest, which is certainly not such as to suggest any considerable degree of mobility. But this mode of breathing is not only abnormal, but, as I think I have already shown, it may be productive of disease. This is true of ordinary respiration, but it is most emphatically true of forced respiration, such as is induced by singing or active muscular exercise. Under the imperative demand for an increased supply of air, the respiratory muscles are made to act with undue violence. In consequence of the constriction and the compression of the abdominal walls by the corset, this abnormal force is largely expended upon the organs of the pelvis, which are forced down out of position. The pelvic floor is more yielding than the rigid walls of the upper chest, and is depressed, thus laying the foundation for chronic displacement. A civilized woman wearing the common dress cannot expand her waist more than one fourth of an inch when taking a deep inspiration. Expansion must occur somewhere, and the abnormal mode of dress necessitates that it shall be at the upper and lower extremities of the trunk. The grater resistance of the upper ribs, and the yielding character of the structures which form the pelvic floor, lead to a lowering of all the organs which are dependent upon the latter for support.

The tracings which I shall present also show an important fact as to the influence of constriction of the waist upon breathing. These tracings were made with a pneumograph, the tracings obtained by which represent the whole of the respiratory movement. Fig. 1, Plate V., represents normal respiration. Noting the time relation between inspiration and expiration, it will be observed that expiration is perceptibly longer than the movement of inspiration. I find this relation to be, on the average, about five for inspiration and seven for expiration. Fig. 2 is a fac-simile of the tracings given by the same person while wearing a corset, who without a corset gave the tracings of Fig. 1. It will be seen that there is an increase in the time of inspiration as compared with expiration, which one would naturally expect from the resistance offered by the corset. It will also be noticed that a marked change in the form of the tracing is produced by the constriction of the waist. The expiratory portion of the tracing, which appears above the horizontal line, drops suddenly instead of making a gradual decline, as in normal respiration. The tracings obtained from the woman in the corset show most clearly an abnormal resistance to the respiratory action.

In natural breathing, the action is chiefly at the waist, although the entire trunk wall, and every organ within the trunk participates in the movement. The action begins with expansion, first at the sides, and then in front, then a slight elevation of the upper chest, and, in forced respiration, slight drawing in of the lower abdomen at the same time. In ordinary respiration, there is simply a lifting forward of the whole front wall of the chest and abdomen, the movement extending all along the line from the upper end of the breastbone to the pubis.

The so-called abdominal respiration is unnatural and unhealthful; indeed, it has been in many cases productive of serious injury. Teachers of elocution and vocal music often instruct their pupils to breathe abdominally; that is, to give prominence to the movements of the lower abdomen in breathing. When the waist is constricted, the inability of the chest to expand at the sides compels an exaggerated movement downward, so that the viscera are forced down into the abdomen to an unusual extent. In natural respiration, the expansion of the waist, or increase in circumference of the trunk at its center, prevents this excessive downward movement. It will be readily seen how, by violent efforts to force the breath down-

ward with the waist confined so as to prevent proper expansion, the supporting ligaments of the various viscera might in time be so stretched as to produce a general sag of the abdominal contents.

Correct breathing is as necessary to the health of the pelvic and abdominal viscera as to a healthy condition of the lungs; for the respiratory act not only pumps air ni and out of the body, but draws blood to the heart, assisting particularly the portal circulation, and thus also aiding in the absorption of the products of digestion, and so facilitating the digestive process. It is quite possible, also, that the rythmical movements imparted to all the viscera of the trunk by normal respiration, are a sort of vital gymnastics, essential to the health of each organ.

It is evident that, in its interference with the proper respiration, as well as from the mechanical injuries which it inflicts, the common mode of dress, which involves constriction of the waist, is the most potent means of impairing the health and vigor of the whole body, and may justly be reckoned as perhaps the greatest of all factors in the general decadence in physical vigor so apparent among women of the present and rising generation.

That there has not been a general rebellion against this unnatural and mischief-making mode of dress on the part of the intelligent women of this enlightened age, is probably due to the popular but fallacious idea which seemes to be so thoroughly fixed in the minds of both men and women, that woman is "the weaker vessel," and naturally subject to ailments and weakness and general physical inefficiency from which men enjoy immunity. Any one who has made himself familiar with the activity of the woman of savage nations, or even the women of the peasant classes in civilized countries, must have recognized the fallaciousness of this popular idea, which had its birth in the age of chivalry, and has come down to us along with numerous other fancies and superstitions which have no foundation either in natural experience or physiological science.

The average civilized woman is certainly very much inferior to the average civilized man in physical vigor. The constancy of this observation has led both the profession and the laity to regard women as naturally weaker than men. But that this is not necessarily so, is shown by the constant experience and observation of travelers among uncivilized tribes. Travelers in China are often astonished at the immense loads which Chinese women carry upon their shoulders. Some years ago I saw a woman in the market-place at Naples, Italy, carrying off upon her head an immense load of vegetables, which required two men to place in position. De Saussure relates that when he had finished his observations in the valley of Zermatt, he packed a collection of mineralogical specimens in a box, and called for a porter to carry it out of the valley, as the mountain roads were too steep to be traveled by four-footed animals of any sort. After a fruitless search for a man who was able to transport his box of specimens, he was finally told if he wished a porter to carry his package, he must employ a woman, as no man could be found who was able even to lift the box. He accordingly engaged a woman who offered herself for the service, and stated that she carried the heavy box of minerals over the steep mountain roads without the slightest injury either to it or to herself. Stanley reports that the two hundred women porters whom he employed on one of his expeditions, proved to be the best porters he ever had in Africa.

When in England, a few years ago, I made an expedition into the "black country" for the purpose of studying the women brick-makers and nail-makers of that region. I found at Lye some of the finest specimens of well-developed women I ever saw anywhere — women who had spent all their lives in brick-yards or before the forge, swinging the blacksmith's hammer and making the anvil ring. These women never go in out of the rain for fear they will get wet and take cold, and although working in mud and water a great share of the time, have no other protection for their feet than shoes, often full of holes and almost without soles and wholly inadequate to protect the feet from water. They are constantly engaged in lifting heavy weights. One woman I saw tossing and kneading upon a block a mass of clay, which, as I found by actual test, weighed over sixty pounds. She handled it in her hands as though it were only a small mass of dough; and although thus employed from early morn until late at night, she was in no way disabled by her occupation. A physician of long experience, who practiced in the place, assured me that so far as his practice among women was concerned, it amounted to noth-

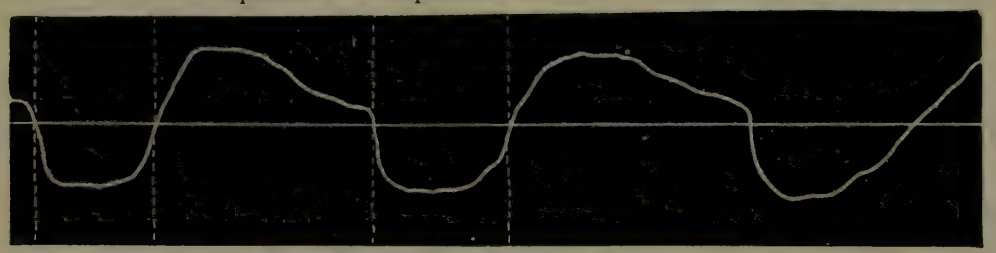


FIG. 1. Pneographic tracing of a healthy woman.

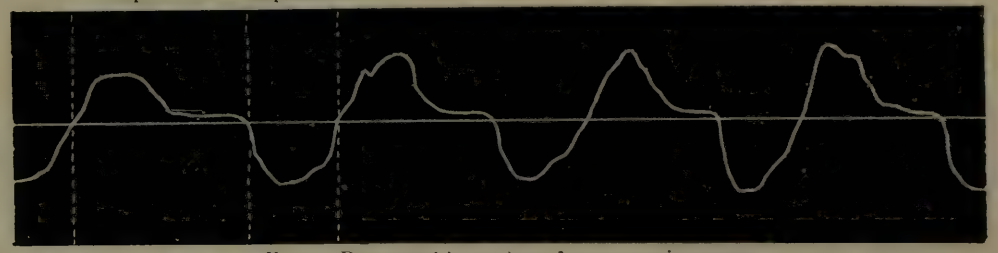


FIG. 2. Pneographic tracing of a woman in corset.



FIG. 3. Copied from a fashion plate.



FIG. 4. A healthfully dressed woman.

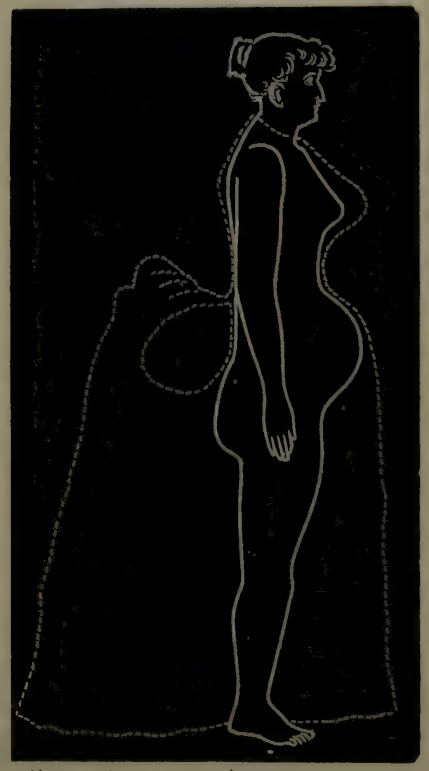


FIG. 5. An unnatural woman attempting to conceal defects.



FIG. 6. A natural woman whose figure requires no appendages.

PLATE V.

ing in a gynecological way, but that his obstetrical practice was very large. Not long ago, a public meeting was held in Birmingham, England, by the nail-makers of that district, for the purpose of protesting against the employment of women in the business of nail-making. The reason given by a prominent member of the association for this objection to the employment of women, was that by this kind of labor a woman became so "unsexed" that she could outwork a man, continuing her labor hours after a man was completely used up.

These facts, and many others which might be cited, show that woman is not necessarily so much weaker than man. The weakness of woman is not due to natural constitution, but to a vicious mode of dress and neglect of physical exercise, although, possibly, heredity has some influence in the matter at the present day.

(To be Continued.)

EXPLANATION OF PLATE. V.

FIG. 1. Pneographic tracing, showing the respiratory movements of a healthy woman. That portion of the curve above the base line represents *expiration*; the curve below the line represents *inspiration*. This tracing was obtained by means of a new form of pneumograph, or pneograph, which represents the whole respiratory movement, and which I have elsewhere described.

FIG. 2. Pneographic tracing furnished by a woman wearing a corset. The subject was the same person who furnished the preceding tracing, and the tracing was made with the same instrument adjusted in the same manner. The evident increase in the length of the expiratory movement, or rather decrease in the length of the inspiratory movement, as well as the change in form of the expiratory movement, are strongly suggestive of the interference with respiration occasioned by constriction of the waist.

FIG. 3. A corset-choked woman (copied from a fashion plate).

FIG. 4. A healthfully dressed woman.

FIG. 5. This and the succeeding figure are intended to show the real origin of busts and bustles. The woman whose figure has been destroyed by corset-wearing requires an artificial bust in front and a bustle behind, to restore the natural curves of the figure.

FIG. 6. A woman with a natural figure who has no use for either bustles or artificial busts.

Radical Treatment for Consumption. —A French surgeon having experimented successfully upon animals, undertook an operation for the radical cure of a patient suffering from incipient tuberculosis, removing the portion of lung diseased, and with such success that the patient made a good recovery, and at the time of presentation, no evidence of disease could be discovered.

LESSONS IN BACTERIOLOGY.

BY PAUL PAQUIN, M. D., D. V. S.

LESSON IX. — EXPERIMENTS ON ANIMALS.

Part 1.

ALL that has been said in our lessons so far, converges into this question: Experiments on animals. The object of touching upon it is to show that a number of diseases are really due to microbes, and to demonstrate how one may verify this fact.

In order to get positive proof that a given disease is due to a particular microbe, it is necessary to establish four conditions, viz.: *a.* To demonstrate the constant existence of the same microbe in the same malady and in no other; *b.* To determine clearly the morphology and the chemical and physiological properties of this microbe; *c.* To isolate it in a state of purity and cultivate it outside the living organism; *d.* To reproduce the original disease by inoculation in animals of the microbe thus cultivated, and to find it in the tissues of the animal so inoculated.

The animals used for inoculations vary. Dogs, cats, rabbits, guinea-pigs, mice, rats, chickens, and pigeons have been used. White mice, because of their low price, their prolific nature, and their susceptibility to many microbic diseases, offer many advantages over the others. They offer particular advantages to busy men without a laboratory. They may be kept in metallic boxes — such as a metallic cracker box, or a wooden one lined with metal, with a cover profusely perforated, or with a wire screen for cover. This box is half filled with sawdust covered with a little cotton batting. The food should consist of oats, and white bread soaked in water. A dozen mice may live in a box a foot and a half or more in diameter. The sawdust needs to be changed about once a month. Mice used in experiments are isolated each in separate glass jars, covered with a perforated glass or metal cover sufficiently heavy to prevent the animals from lifting it. These should be thoroughly cleansed and filled a third or a fourth full with sawdust. To raise mice in the laboratory, the couples should be separated in different boxes, and when the females are near term, they should be isolated in glass jars as above. After the young have their eyes open, they and the different mothers may be put together in

one box. They will get along fairly well. But old males are quarrelsome, and sometimes devour the young.

The rabbits may be kept in cages so arranged as to allow of daily cleansing. A better way is to keep the adult rabbits not actually in use, in a large box stall, with plenty of straw, etc. They may be fed oats, cabbage, etc., and should be provided with water. The subjects under experiment must be isolated and kept in clean cages. Rabbits may be raised easily for laboratory purposes. But if one would have the best results, the females, when nearing term, should be separated from the males and put in a large, warm box, with sawdust or dry earth, and dry leaves, or straw, or cotton for nests. The males often kill the young, if left with them. The little ones should not be put with larger, strange rabbits in a closed place; the progenies of about the same age may be raised together, thus insuring less fighting later.

Guinea-pigs may be kept in cages like rabbits, and raised somewhat on the same principle.

Dogs need special places and thorough, daily cleaning. They are disagreeable brutes to deal with, as they sometimes howl continually.

Cats are not much better subjects, and are not easy to inoculate, owing to their too handy claws.

Fowls may be kept in ordinary cages, in isolated places, and used when needed.

(To be Continued.)

Digestion of Milk in the Young.— Dr. R. Romme, who has investigated this question thoroughly, concludes as follows from a part of his observations: The first action on the milk when it reaches the stomach, consists of coagulation on the one hand, and caseification on the other, under the action of a special ferment secreted in the gastric juice by glands in the stomach. This ferment is related to other soluble ferments of the economy. After Hammerstein: One part of this ferment is capable of coagulating 420,000 parts of casein; and Soxhlet has calculated that the quantity of ferment contained in the stomach is sufficient to provoke, in thirty minutes, the coagulation of 6000 liters of milk. The action of the ferment requires a certain length of time to manifest itself, and the coagulation is effected the more readily the greater the quantity employed. Elevated temperatures, from 145°F. upward, abolish the action of the ferment. The most favorable temperature is about 92°F. The acids equally coagulate the milk, as is well known, only the process is not the same in the two cases, and the coagulum differs a great deal according to whether it is produced by acid or a special ferment. Arthus and Pages define the differences of action thus: "The casein of milk is precipitated by an acid, and is caseified by the *lab*-ferment."

The notion still existing, then, in the minds of many, that lactic acid alone produces the coagulation in the digestion of children, is not sustained by Dr. Romme's observation. These researches may lead to some important discoveries of practical value in the feeding of infants.

A Thermogenous Substance in Urine.—M. Paul Binet has isolated from human urine a substance which is capable of producing fever by hypodermic injections. The substance is found chiefly in the urine of tuberculous persons, but it exists also in the pathological urines of other classes, and even in normal urines, though with an inferior degree of activity. By injection, it acts with particular intensity on tuberculous guinea-pigs or those which have suffered inoculation of tuberculosis. However, it is possible to observe under certain conditions a fever in and sound animals, particularly the young, females, in lactation. Subcutaneous injections provoke, in these conditions, an elevation of temperature of 1° to 3° F.; the maximum is reached generally about the third hour after the injection, and the fever lasts between four and five hours. M. Binet has practiced injections on eight tuberculous guinea-pigs, and seventeen sound guinea-pigs; the substances used were respectively a glycerine extract diluted with water, and an aqueous solution of an alcoholic precipitate. These injections, 185 in number, have never produced any abscess. Of the tuberculous guinea-pigs, every one had a rise of temperature. Of the seventeen sound guinea-pigs, nine presented a rise of temperature; but in all of them it was less constant, and milder than in tuberculous cases. The effects produced by the urines of tuberculous subjects (human) have been, in most cases, more pronounced and more elevated than those produced by other pathological urines, or by normal urine.

The results of further experiments in this line will be awaited with interest.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE MORPHOLOGY AND BIOLOGY OF THE YEAST FUNGUS.

BY DR. JOHANNES RAUM, WARSAW.

Translated from the *Zeitschrift für Hygiene*, Vol. X. No., 1. by H. W. Loeb, A. M., M. D., St. Louis, Mo.

[The article with the above title is entirely too voluminous to be translated in full for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE. The translator, however, mindful of the value of the paper and of the interest taken in it by American scientists, has translated that portion which refers to the plates, and which explains and elucidates them.]

I. SACCHAROMYCES CEREVISIÆ I.

(FIGS. 1–14, FRONTISPIECE.)

A QUANTITY of pure culture was introduced into a glass of beerwort, and placed in the incubation apparatus at a temperature of 25° C. Soon afterward bubbles of carbonic acid arose from the bottom to the surface of the liquid, and later a white foam appeared. In twenty-four hours the fermentation was well established, the yeast collecting in a considerable quantity at the bottom of the vessel. It may be remarked, by the way, that I obtained the beerwort used from one of the best breweries in this country. Out of this I made a sterilized mixture of ten per cent of grape sugar and five per cent of malt extract, with a hundred parts of spring water. All of my yeast experiments succeeded excellently with this.

To make specimens for microscopical examination, a sterilized platinum probe was introduced into the midst of the culture, and the preparation spread in a thin layer upon the slide, either drying it in the air, subsequently drawing it cautiously through a flame, or after Lukjanow's method, first fixing it with sublimate, and then drying it. In order to differentiate the morphological details within the yeast-cells, I used Gaule's fourfold stain. However, when, on account of the diffusion of the staining, it was found unsatisfactory, I then made use of the stain suggested by Ernst, which consists in treating the specimen with a slightly warmed solution of methyl-blue (Löffler's) and with a cold solution of Bismarck brown. By the use of homogeneous immersion, there could be seen in the center of the cells a variable number (one to fifteen and more) of large, spherical, black granules, while the surrounding protoplasm appeared more or less uniformly brown. (Figs. 1 to 5.) We were unable to demonstrate any structure in the granules, nor was it possible to observe any close relationship between their size and the dimensions of the cells which contained them. A large granule which lay in a small cell surrounding it could often be seen. With reference to the position of the bodies within the cells, it was evident that they were either central, or as was frequently the case, they were placed at the periphery. In the specimens of oval yeast-cells, these granules were generally grouped at one or both poles. In their external arrangement, they exhibited an almost constant regularity, being either in circles or segments of circles. By reason of their staining, the black granules must be indentified with the so-called sporagenic granules of bacteria.

Besides the already mentioned stain of Ernst, other staining methods permitted us to settle the question as to the granules, especially Löffler's methyl-blue with the subsequent decolorization by means of acidulated alcohol; the hæmatoxylon of Böhmer and Delafield, however washing out the preparation beforehand with alcohol; finally, eosin, or rose-bengal, and after-staining with methyl-blue. Neither carbolic fuchsin, Platner's nuclear black, nor methyl-green acidulated with acetic acid, gave any positive results. Zimmerman's method for plant-slides, recommended by Altmann, was without avail.

While no granules in proliferation appeared in the cells, we nevertheless could observe them at the entrance of the sprouts. Their contents must at least in many cases be considered viscid, for they do not always retain the same spherical form in passing the connecting layer between the mother-cells and their daughter-sprouts, and they seem sometimes to extend in length, and to be cast into the cells. In this migration, a scattering of the substance not infrequently occurred. (Figs. 6 to 11.) In general, my impression is that while the mother-cells retained the greater portion of the before-mentioned black granules, they delivered the smaller portion to the sprout-cells. So far as my experience reaches, all cells in a true yeast culture at the height of their development, old or young, are found containing black granules, in the mother-cells as well as in the sprout-cells.

With reference to the determination of the chemical nature of these black bodies which were discovered in the yeast-cells, I prepared a series of reactions upon the yeast-cells of different ages. In the first place, they were exposed from 24 to 48 hours to the influence of artificial gastric juice, in a thermostat at 40° C. After the artificial digestion and the subsequent washing with alcohol, the granules disappeared, so that none were visible to the eye, although the before-named stains had been used. The same result occurred following contact with a five per cent solution of caustic potash for a short time. Simply treating the yeast with boiling alcohol produced no effect upon the color-reaction. Perosmic acid did not produce in these the customary reaction for fat. The solution of iodide of potassium left a diffused yellow or reddish-brown color. The first of these appeared in those cells which were in the state of hunger, while the others occurred where the cells were well nourished. In using the word "diffuse," I wish to state that the iodine reaction does not indicate any specific morphological constituents of the cells. I have often seen cells in the center of which there appeared larger portions of matter of a reddish-brown tint, and yet I have never made up my mind just what conclusion to draw with reference to the relation between those portions of matter and the accumulation of granules, etc. It must be further observed that the complete non-appearance of the iodine reaction frequently coincides with a greater or less accumulation of granules. I did not recognize the blue coloration, which is indicative of strength. I would not leave this circumstance unmentioned, from the fact that Ernst did not attempt to determine the presence of carbohydrates in his sporagenic bacterial granules. Warming the yeast preparation with Million's reagent gave a uniform redness to the entire cell contents. I have repeated the micro chemical reaction upon all of my yeast experiments, and have obtained the same results.

In the culture of yeast upon fixed nutritive media at the ordinary temperature of the air, the black granules are formed; however, there must be added to the agar or gelatine a slight amount of grape-sugar. The absence of the sugar or the presence of glycerine (six per cent) prevents this condition of affairs. When, for example, the agar was mixed with two per cent of grape sugar, the formation of granules coincident with the fermentation took place just as lively as before, especially at a temperature of 25° C. (77° F.). In about two weeks, the multiplication of granules gradually subsided. The cells, which we had previously observed rich in granules, now appeared poor, and some seemed entirely devoid of granules. In addition, we saw some, which besides a larger or smaller granule, showed one or more pale-colored, round-shaped vacuoles. (Fig. 14.)

The spores exhibited an unsymmetrical retention of the stain. (Figs. 12 and 13.) When the specimens were stained with methyl-blue and Bismarck brown, no mixing of the stains occurred, with the exception of the black granules which were situated at the periphery of the spores; however, the spores took up the blue stain while the protoplasm generally was affected by the brown. The spores commonly exceeded in size the so-called granules, and approached that of the vacuoles. Their number does not seem to be greater than that of the vacuoles; the maximum number in a cell noticed by me was four. With reference to their position in the cells, it may be stated that they are sometimes irregularly scattered, and sometimes placed along the longitudinal axis of the cell. In the center one may often see light spots; however, at the periphery may be seen small, black granules which are identical with those already mentioned, and which are found either solitary or united in larger groups. The shape of the yeast spores was generally circular, but often they appeared egg-shaped. Among the well stained examples, we not infrequently came across some forms of the same size, sometimes smaller, which were stained with Bismarck brown. I was unable to discover a nucleus containing a nucleolus such as Zalewski saw.

When the yeast was placed in agar not containing sugar, the vacuoles and spores of the above-mentioned variety were formed, except that there was a luxuriant development of black granules. I also obtained spores upon plaster of paris (Hansen), which I allowed to stiffen in the shape of an oblique plane. Similarly, I obtained the spores in distilled water, and upon filter-paper (Wasserzug). In the later phases of their growth, in which the spores assumed successive volumes, the surrounding protoplasm gradually vanished, and the spores then appeared lying free, after the manner of their former arrangement.

II. Saccharomyces Ellipsoideus.

(Figs. 15–23.)

In these as well as in the following cases, the same methods of cultivation and preparation as in the above-mentioned experiments, were used. We had, in this particular, the opportunity of observing with the help of the microscope that the number of large, black granules in each individual cell is small. (Figs. 15 and 16.) But in size, position, and grouping, they are in conformity with the saccharomyces cerev. I. The same thing holds in general with regard to the spores. (Figs. 17–19.) The spores are regularly round in shape, and they contain numerous dark-colored granules which lie mostly on the periphery. Among the well-colored spores, there appeared some detached structures of a slightly brown color, here and there, which were more or less numerous, and contained little protoplasm. We observed among the spore-containing specimens of the yeast in the old cultures, and also in the cells, that the greater number contained small, black granules (Figs. 20 and 21), which were distributed irregularly in the protoplasm. Cells containing vacuoles were by no means infrequently seen. (Figs. 22 and 23.)

III. Saccharomyces Ellipsoideus II.

(Figs. 24–29.)

The granules just spoken of do not appear to attain such luxuriance in general in this form of yeast plant, as in the two varieties just mentioned. Among the smaller specimens of the structures we perceived larger masses similarly colored black, which evidently resulted from the union of the smaller granules; and among the spore-containing cells we found some which, besides the spores, held a number of black granules. (Fig. 26.)

Again, quite frequently, cells were found which lodged, besides one or more well colored spores, some bodies which appeared identical with these, but which were stained, either with Bismarck brown (Fig. 28) or slightly with methyl-blue. (Fig. 27.) Small black granules were rare in spores of the Saccharomyces Ellipsoideus II.; generally they were solitary.

IV. Saccharomyces Pastorianus I.

(Figs. 30–38.)

There appears at first sight a distinct difference between the long, cylindrical forms of these cells, and the three classes of round or oval specimens of yeast plants just considered. Further, this yeast-fungus is noteworthy on account of the size of the granules. Very frequently we find only a single large ragged granule, sometimes two, which might easily be mistaken for a nucleus. However, the absence of an interior structure, and above all the irregularity of its contour, weigh against this conclusion. (Figs. 30–34.)

In many yeast-cells there were large numbers of small globules. (Figs. 35 and 36.) Their share in the proliferation could be easily observed by the eye; one could see them slipping and pouring into the sprouts. (Figs. 37, 38, and 39.) We found in the older cells one or several round vacuoles and sometimes black granules. (Figs. 40–43.) The young sprouts were also covered with vacuoles. It is a fact worthy of mention that the yeast-cells may attain their development without a distribution of black granules. (Fig. 45.)

Here and there we met with young yeast-cells, which contained vacuoles, but no indication of a black colored substance. (Fig. 46.)

The spores of the saccharomyces pastorianus are smaller than the forms of yeast plant previously described; yet the circular forms are also seen, and they act identically under staining agents. Their size often depends upon the black granules. I have never found more than three spores in a single yeast-cell. Among the well-colored spores I have observed frequently some light-brown colored bodies. (Figs. 47 and 48.) The vacuoles, too, in certain specimens appeared to be able to distribute themselves. (Figs. 43–48.) In Fig. 47 some black granules are visible.

V. The Saccharomyces Cerevisiæ

(Figs. 49–62)

Which I have isolated from the commercial compressed yeast of this country, exhibit much more pronounced phenomena of fermentation than the saccharomyces cerevisiæ first described. Under the microscope, the cells themselves and their divisions show at first the same proportionate dimensions as the granules, spores, and vacuoles.

The former, which vary in number and size, have an irregular contour when they are larger, and are circular when smaller.

By staining with Delafield's hæmatoxylon and saffron, the granules take on a marked violet tint, while sections of the protoplasm are more deeply colored. (Figs. 49, 50, and 51.) In the older cultures, by staining with methyl-blue and Bismarck

brown, large, formless, irregular black masses become visible. (Fig. 52.) In still older cells, we observed larger single black granules, and near the center vacuoles which were almost completely colorless. (Fig. 53.) In old cultures of beerwort, I observed yeast-cells, within which were visible spherical aggregations of larger or smaller, black or deep brown granules. (Figs. 54, 55, and 56.) These last forms seem to be especially important in the solution of the question of the occurrence of nuclei in the yeast-cells.

When in examination the granules were grouped in the form of a spheroid, in the center of which lay a large granule, we might entertain the suspicion that it was a question of nucleus among nucleoli. But when we observed a whole row of transition forms, we could readily determine that it was a special arrangement of the granules, rather than of genuine nuclei. For the traditional type of the nucleus, there are wanting, above all things, the nuclear structure and membrane. Furthermore, it is hardly probable that the genuine nuclei would exist in the condition which our drawings indicate, and then disappear. However, it must not be said that from other standpoints the nuclear character of the black granules can be so easily denied. It may be that Altmann's theory of the structure of the nucleus depends upon this.

Dark granules are occasionally found in some of the spores, but generally those of a certain size. The spores lie sometimes without order and sometimes correspond to the long axis of the cell. (Figs. 57, 58, and 59.) In Fig. 59 is seen a small blue process of a spore. In some yeast-cells which were colored with Bismarck brown, there were circular forms observed; vacuoles are not absent in these forms. A specially interesting form is shown in Fig. 62; in this are seen two lengthy cells, which, from a transient inspection, would give one the impression of a single cell. In one of these the presence of four spores is noticed, in the other only a single well colored spore is apparent; while the other portion of the cell claims attention on account of four circular vacuoles. It is worthy of remark that the vacuoles, so far as the size and arrangement of the long axis of the cell are concerned, correspond to the natural form of the blue-colored cell. The contents of the small black granules, with respect to the vacuoles and spores, are beautifully illustrated in the object mentioned. We see that the granules are found really only on the periphery of the vacuoles.

(To be Continued.)

Variola and Vaccine.—Dr. Chauveau, Professor in the Museum of Natural History of Paris, communicated to the public a *résumé* of his researches on the subject of the transformation of the virus of smallpox into vaccinia, or vaccine: —

It is well known that a number of physicians and most of the people believe that vaccine, or vaccinia, produced from the bovine species for the purpose of vaccination against smallpox, is nothing else than smallpox virus itself, modified by successive passages through the animal organism. The Commission of Lyons, France, under the direction of Dr. Chauveau, has established, it seems very positively, that (as has long been believed by most thinking scientists) this is not the case. The virus used for vaccination (cow-pox or horse-pox) is certainly a close relative of the virus of smallpox, and it is perhaps legitimate to admit that they were derived from a common source or from one another, in centuries past. But at this time they are a distinct species, and it seems impossible to reduce them to a single species by the known methods and artifices of experimentation. Inoculations of smallpox in the horse and in cattle produce variola in them, and the introduction of the virus thus produced in these animals, gives to man variola itself. It was found that the animals inoculated with smallpox became immune against vaccinia, just the same as man inoculated with vaccinia becomes immune against variola.

The symptoms of these different viruses in animals vary considerably, and there can be no mistake made in the diagnosis.

Messrs. Haccius and Eternod of the Vaccinal Institute of Lancy, Geneva, produce a vaccinal lymph cultivated on calf, which is said to be transformed from variola, and not very long ago published their conclusion that variola and vaccinia are probably identical. M. Chauveau, in experimenting with this lymph, found that it contained, in reality, the true virus of smallpox, and therefore it is a dangerous article to use for vaccination. Vaccine, then, should not for practical purposes be considered as an attenuated variola virus, for the two are now distinct, and both are strong viruses of their respective species, whatever their origin may have been.

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

The Action of Common Salt on Bacteria. — In *Archive für Hygiene*, Vol. XI., p. 60, C. J. de Freytag explains his researches on the action of chloride of sodium on certain bacteria. He found that the bacilli of charbon are killed after two hours, while their spores are still alive after six months. The bacillus of typhus resists at least five months; that of Rouget (French swine plague), two months. The bacilli of cholera are destroyed in six or eight hours; the streptococcus of erysipelas was still alive after two months; the staphylococci resist at least five months; the bacillus of tuberculosis is not dead after three months, nor is that of diphtheria after three weeks.

Action of the Gastric Juice of Man on Pathogenous Germs. — M. G. Kurloff and K. E. Wagner, in a Russian article analyzed by Mr. Heidenreich, in the *Centralblatt für Bacteriologie und Parasitenkunde*, give the result of investigations concerning the action of the gastric juice of man on disease germs. In the first place, they ascertained that the micro-organisms found in the stomach do not live in the gastric juice of a healthy individual longer than from a half hour to an hour, and perish more or less rapidly according as the juice is more or less acid. The average number of microbes found in a healthy stomach was 700, a quantity too insignificant to admit of a notable action in the digestion. The bacillus of anthrax, the spirillum of cholera, the bacillus of typhus, tetanus, blue pus, glanders, and the staphylococcus pyogenes aureus perished generally at 37° C. (or about 99° F.), in a half hour; the bacillus of tuberculosis, and the spores of the anthrax bacillus resisted twenty-four hours. On the other hand, the first series named, prospered in gastric juice neutralized or rendered slightly alkaline. The gastric juice was taken from the stomach of a healthy man by means of a sterile stomach-pump. Messrs. Kurloff and Wagner conclude as follows: —

"1. There are no special or constant micro-organisms in the stomach; those which arrive there perish rapidly, and are without action in digestion.

"2. The gastric juice destroys pathogenous microbes energetically, and if they happen to penetrate into the intestines, this effect is produced independently of the gastric juice as such.

"3. Only the sporiferous organisms, such as the bacillus of tuberculosis, the bacillus of charbon, and staphylococcus pyogenes aureus may resist the action of the gastric juice. The others perish in a half hour."

Influence of Temperature on the Bactericide Action of Light. — A great number of investigators, including Roux, Tyndal, Duclaux, and Strauss have investigated the property of light upon microbes. More recently Mr. Santori Saverio (*Annali dell' Instituto d'Igiene Sperimentele dell' Universite di Roma*, Vol. II., Series 2, p. 121) has taken up the question with special reference to the influence of temperature on light and its bactericide action. The following is the conclusion to which he has arrived: —

1. The bactericide action of solar heat manifests itself with great energy, even when it is not accompanied by an elevated temperature.

2. The violet and red rays of solar heat, isolated as much as possible by means of colored glass, do not cause the death of micro-organisms, nor any visible changes in their development.

On the Structure of Bacteria. — The scientific world has about uniformly accepted the theory that the nucleus is an indispensable element of the normal cell. The only ground for doubt seems to exist in the fact that the morphology of bacteria is not clear, and that it is uncertain whether they contain any nuclei. Prof. Butschli of Heidelberg has, not long since, contributed an important discovery bearing upon the structure of bacteria, tending to prove that even these minute organisms are provided with nuclei. Ernst, as far back as 1888, discovered corpuscles in bacteria, or rather granulations which were colored by the ordinary coloring agents of nuclei, notably hæmatoxylon. He concluded that each of these granulations represented a nucleus. Prof. Butschli in studying the *chromatium okenii*, a bacteria belonging to the sulphurous group, discovered a nucleus that he could stain with hæmatoxylon. Under the colored annular layer of the *chromatium* exists the uncolored central portion which

contains granules of sulphur. In the individuals fixed by alcohol and colored by hæmatoxylon, the central portion is stained more than the rest. In some cases the aspect of the bacteria is that of the cell with its nucleus. The central portion of the cell exhibits a spaced structure; it is not produced by a dissolution of the granules of sulphur, and it is chiefly observable in samples fixed by osmic acid or picro-sulphuric acid. The structure of the color ring is clearly seen in these preparations, and as a rule, there is a unique layer of radial lines which join the central part of the cell to the membrane.

In the specimens fixed by absolute alcohol and colored with hæmatoxylon, may be seen, in the central portion, a number of granules which may be distinguished by their coloration of reddish-violet of the acid hæmotoxylon, while the substance of the nucleus presents the blue coloring of the alkaline hæmatoxylon.

Tubercular Germs and Hospital Dust. — According to the *Times and Register*, Prof. Foa has been investigating hospital dust in one of the hospitals at Turin. He selected a room in which there were six tuberculous patients; then scraping the wall on a level with the night table, he injected some of the dust into three guinea-pigs, of which one remained alive, and one died in twenty-four hours of pyæmia. The other being killed at the end of three weeks, was found to be affected with general tuberculosis. This shows the importance of keeping hospitals, and we might add, lecture rooms, churches, and all other places where human beings congregate, free from dust.

Destruction of Microbes by Amœboid Cells in Inflammation. — Dr. Armand Ruffer, in a number of the *British Medical Journal*, presented the following conclusions to some of his experiments: —

"The inflammatory phenomena consecutive to the introduction of the symptomatic bacillus under the skin of the guinea pig, have a productive and useful character, and the destruction of microbes at the point of inoculation is produced entirely by amœboid cells contained in the inflammatory exudate."

Since then, Dr. Ruffer has made experiments with the bacillus of Chauveau, by inoculation on the rabbit, which animal was regarded as refractory to this disease by Arloing, Cornevin, Thomas, Roux, Nocard, and others, and he concludes as follows: —

"The immunity of the rabbit against the bacillus of Chauveau is only relative, and not absolute. This relative immunity is not due to the want of nutritive matter, for, if the dose is large enough, the bacillus is easily cultivated in the tissues of the rabbit."

This leads to the belief that the natural immunity of the rabbit against this particular bacillus does not depend on the want of nourishment in the tissues, nor on the exclusive power of the phagocytes to destroy all the microbes, but that various causes operate in the fight against the invasion. It brings to mind the idea that in man, immunity against certain maladies is perhaps always only relative, and that the chief method of protection rests on a number of natural means of protection of the organism, which a certain large quantity of microbes might overpower

The Bacillus of La Grippe. — Through the kindness of Dr. Fred R. Belknap we have just received a copy of a German paper containing a report of a recent exhibition by Prof. Pfeiffer, son-in-law of Prof. Koch, before a meeting of German medical gentlemen of high standing, recently held in Berlin, of the newly discovered germ which is the cause of *la grippe*. As we understand the report, Prof. Pfeiffer discovered the germ two years ago, when the epidemic was prevailing so extensively, but was not at that time able to confirm his discovery by a sufficient number of experiments to warrant him in presenting it to the public with entire assurance. During the prevalence of the present epidemic he has had ample opportunity to study the organism, and has obtained what he believes to be positive proof of its nature. He finds the germ to be a bacillus, and much the smallest organism of this sort which has ever been discovered, its length being only one half that of the minute germ which produces septicæmia in the mouse, although its diameter is the same. The bacilli usually occur two together; are so small and short that they often look like micrococci, and may be cultivated. They sometimes occur in chains. The last-mentioned fact accounts for their not being discovered before, as they have been mistaken for the streptococcus, which they very closely resemble. The bacillus is found chiefly in the mucous membrane and the sputa.

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TO OUR SUSCRIBERS.

THE BACTERIOLOGICAL WORLD enters its second year of existence wedded under the name of BACTERIOLOGICAL WORLD AND MODERN MEDICINE, as seen by our last two numbers. We beg again to assure our readers that, notwithstanding the reduction of subscription price, the change does not indicate any retrenchment in our bacteriological studies, but rather an increase in quality if not also in quantity, with the addition of discussions on different topics of modern medicine.

In greeting our friends, and the public interested in medical science, and extending to all our heartiest good wishes for 1892, we take the opportunity to announce that the subscription of every one who paid for the year 1891 expired with the December number of that year. We trust that all will renew, and that many new friends will join us, and aid us in our endeavors to disseminate information on the various subjects of bacteriology, and the different departments of modern medicine, such as electrotherapy, massotherapy, balneology, etc., etc.

OUR COLLABORATORS AND CONTRIBUTORS.

DOUBTLESS our readers are gratified to find the names of so many prominent scientists of various nations on our list. It is good evidence that during the year the BACTERIOLOGICAL WORLD AND MODERN MEDICINE will not lack for interesting and useful matter from the most reliable authorities on the most vital subjects of medical science. Reference to our title page will convince our readers of the strength of the corps of writers and medical thinkers who have consented to present some of their choicest thoughts, and the results of some of their researches, before the American medical fraternity through our columns. We are still negotiating to secure the names of other prominent men of science, and we are pleased to announce that Prof. Metchnikoff of the Institute Pasteur of Paris, in a recent letter to us, advises that he will, as soon as consistent with his present engagements, contribute to the BACTERIOLOGICAL WORLD AND MODERN MEDICINE. The renowned advocate of phagocytosis needs no special introduction to our readers.

THE GERMICIDAL PROPERTIES OF MILK.

DR. FREUDENREICH, after a series of experiments on the action of raw milk on bacteria, has come to the conclusion that it possesses remarkable germicidal properties. He claims that the bacillus of cholera in fresh cow's milk dies in an hour; the bacillus of typhoid fever in twenty four hours, while other germs die at the end of varying periods. He further found that milk exposed to a temperature of 131° F. loses this germicidal property, as does also milk that is four or five days old.[1]

These experiments will set the physicians to thinking very seriously on the advisability of sterilizing milk for infants' food, or for food of adults. We were just congratulating ourselves on the fact that a means of preventing the introduction of disease into the human body through milk, had been discovered in sterilization. According to Dr. Freudenreich, one might conclude, at first thought, that we were mistaken in our expectations and confidence, and that raw milk is, after all, preferable for human consumption. While this view of the case seems reasonable, yet, in our judgment, it should not obtain;

[1] A notice of this was given on page 60 of the December number of the BACTERIOLOGICAL WORLD.

for the experiments in question do not indicate that the sterilization of milk should not still continue, and be considered a great source of protection against the germs which may be found in this fluid. In fact, the object of the artificial sterilization of milk is: First, to deprive the milk of its fermentive properties, that is, to destroy the micro-organisms that cause it to ferment; and, secondly, to destroy the microbes of disease that may accidentally be in them. The first object named is the chief one.

Whatever Dr. Freudenreich may find concerning the microbicide powers of milk upon disease germs, it is evident that raw milk is not a destroyer of all germs which produce irritant or septic poisons. It is only sufficient to let milk stand, and allow all kinds of germs that may, to live at the expense of it, to prove this to any one. Consequently, sterilization is needed to destroy those organisms which milk in its raw condition is unable to destroy, and these are certainly the most common as well as the most dangerous of the germs of milk, particularly in infant foods. It is not so much to destroy the germs of typhoid fever, or tuberculosis, or any other disease, that sterilization is recommended, but to destroy germs which cause the transformation of the various substances composing the milk, and create nefarious products. Granted that raw milk is a bactericide of certain disease germs, this does not militate against its sterilization for the other deleterious organisms which it does not destroy. If, for instance, the bacillus of cholera dies in an hour in fresh cows' milk, and the death of the bacillus of typhoid fever occurs at the end of twenty-four hours, artificial sterilization can hasten this destruction, and kill these germs within a few minutes. So, from a practical standpoint, no matter what may be the germicidal property in the milk, it does not follow that one is warranted to depend on it alone for the sterilization of milk.

The demonstration of the experimentalist named, has a great scientific value. Showing, as it does, the microbe-killing power of this composition, this experiment proves, or at least indicates, that milk for a certain time contains the properties of certain other vital fluids of the body, such as blood-serum, and it also suggests that probably the transmission of certain disease germs from animals to man through raw milk as generally utilized, is, in a measure, prevented by its natural powers. We cannot see that the discovery should in any sense be taken as an indication of a safeguard against individual diseases produced by milk ferments, particularly the various and numerous maladies of the alimentary canal. We would not even consider it a sufficient safeguard against the transmission of such germs as those of typhoid fever or other pathogenic germs of a similar nature, because frequently milk is drunk very fresh, several hours before the time which it would require to kill them. P. P.

THE HYGIENE OF VALVULAR DISEASE OF THE HEART.

The time when the physician, consulting with a patient suffering from organic disease of the heart, was justified in sending him away with the statement that nothing could be done for him, is, fortunately for this class of invalids, long in the past. The patient suffering from organic disease of the heart, who falls into the hands of a physician who follows a routine practice in all cases of this sort, may be, however, equally unfortunate with the patient suffering from the same malady fifty years ago.

It is undoubtedly a common custom with physicians who are consulted by patients suffering from valvular disease of the heart, to administer digitalis in some form as a matter of routine practice, without taking into careful consideration the condition of the heart as regards compensation. When one considers the potency of this drug, and its power to produce functional disturbance when used under conditions in which it is contra-in-

dicated, it is clearly apparent that this practice is much to be lamented. It doubtless many times occurs that patients suffering from valvular disease of the heart, with full or excessive compensation, have been made to suffer from functional disturbance of the heart, which, in the natural course of the disease, might not have appeared for years. The person suffering from this stage of organic disease of the heart really requires little or no medication. Regimen and the employment of such simple hygienic measures as the patient can himself administer, are all that the average case demands.

Dr. O. Fraentzel, Professor of Medicine at Berlin, lays down the following hygienic rules for a person suffering from valvular disease of the heart, when compensation exists : —

The patient should not live higher than the first [second] floor, so as to avoid the condition of the heart so easily produced by ascending stairs. In the winter he should have an apartment facing the south ; in summer he should live in apartments facing the north. He should dress according to the season — neither too warmly nor too lightly. He should wear flannel, woolen stockings, and shoes with thick soles, so as to avoid wetting the feet. He should accustom himself to sleeping on a hard hair mattress. He should take, once or twice a week, a walk in the open air of a distance proportionate to his strength, but never exceeding an hour and a half. After eating, he should rest for an hour or two.

The dietary should be carefully regulated. All exciting foods must be interdicted. The patient should also be forbidden to take a large amount of food at one time.

According to Dr. Fraentzel, the patient should take three meals a day, with breakfast consisting of a pint of milk and a little bread and butter. He says : " Coffee must be avoided, for it often produces palpitation of the heart, irregular pulse, and increases the sensation of oppression, if it exists."

The author advises that the mid-day meal, taken at twelve or one o'clock, should be the principal meal of the day. All spiced and fat foods must be avoided, especially fat fish.

The evening meal should be as sparing as possible, so as to secure to the patient refreshing, calm, and prolonged sleep.

The author considers the reduction of the quantity of drink a matter of importance. In patients who are emaciated, one simply interdicts excess of fluids, requiring the patient to drink with small swallows, and to take no more liquid than is strictly necessary to quench thirst. But in corpulent subjects, especially those in which there is a tendency to œdema, one must reduce the quantity of fluids to a quart and even less *per diem*. At the beginning, this regimen is often very difficult to support, but the patient soon habituates himself to it, and appreciates the beneficial effects thus secured, which appear from one to two weeks after this regimen is begun. Beer and champagne, as well as coffee, are especially interdicted. When deficient compensation becomes evident, the use of digitalis should, according to the author, be avoided as long as possible. The use of tincture of valerian often secures, in his hands, complete and durable re-establishment of the compensation. Baths and exercise are often useful, according to M. Fraentzel, but must be used with discrimination. He says of the employment of Swedish movements : " One obtains, in many cases, results truly brilliant, manifesting themselves by a considerable increase in the energy of all the functions of the body. . . . The same thing can be said concerning baths."

J. H. K.

COLD BATHS IN TYPHOID FEVER.

It is encouraging to note that the profound faith which the profession seemed to have placed in antifebrin and antipyrin, and various other toxic agents, as a means of lowering the temperature in fever, is beginning to wane. The writer

has often seen patients suffering from typhoid fever who were almost in a state of collapse as the result of large doses of antifebrin or antipyrin; the temperature was subnormal, extremities cold, pulse almost imperceptible, and the fact indicative of a state bordering on that observed as the result of a severe shock. There are numerous drugs by the administration of which the temperature may be lowered, but the effect obtained is always toxic, and it is a question well worthy of consideration, whether the patient is likely to suffer more from the elevation of temperature than from the depressing effects of the drug by the administration of which the temperature is lowered.

Recent experiments seem to show that in fever there is not usually a very great increase of heat production, but that the rise of bodily temperature is due rather to decrease of heat elimination. What is desirable, then, is not the administration of a drug by which the heat production shall be checked, but the employment of means by which heat elimination shall be increased.

The best means of increasing heat elimination are the various methods of applying cold to the surface. Large compresses consisting of a folded sheet wet in cold water, the cold wet sheet pack, cold sponging, the graduated cool bath, and the cool enema are the best means of lowering the temperature by aiding heat elimination. The temperature can almost always be brought down by this means from ½° to 2°, and when lowered in this way, the temperature usually remains at a lower point for some hours, whereas, when the temperature is brought down by the administration of a drug, it quickly rises again.

We are glad to note that these means of lowering the temperature, particularly the cool bath, are rapidly coming into use in this country. They have for some time been the regular treatment for febrile conditions in France and Germany. This method was adopted some little time ago by the German Hospital at Philadelphia, as the result of which the mortality in typhoid fever has been reduced to 4 or 5 per cent, a great contrast with the fatality of 17 per cent, which previously prevailed. The Hospital of the University of Pennsylvania, the Presbyterian Hospital, The Pennsylvania Hospital, and the Johns Hopkins Hospital of Baltimore, have recently followed the example of the German Hospital in introducing these means of treating fever. We have relied upon these means in the treatment of typhoid fever for nearly seventeen years, and with the most satisfactory results. In one instance we treated thirty cases of typhoid fever in succession, without losing a single case. The absence of severe complications was particularly noticeable in these cases. Severe intestinal ulceration occurred in only one case, and there was marked delirium in only two other cases.

A caution ought not to be forgotten whenever cold is recommended in the treatment of typhoid fever cases. It should be remembered that the purpose of the cold application is to facilitate the elimination of heat. If the surface is already cold and has a bluish appearance, then, of course, cold applications should not be made. Instead, a hot blanket pack or a hot bath should be administered. A large hot enema is, in these cases, a very valuable means of overcoming the spasm of the cutaneous vessels, thus bringing the blood to the surface and encouraging the elimination of heat. Cold should never be applied in such a manner as to produce prolonged chilliness, as this will defeat the very purpose for which the application is made. The surface must be kept warm. This rule is imperative. The writer has frequently seen the temperature reduced from 104° or 105° F. to 101° or 102° within two hours, by the application of the blanket pack, woolen blankets being wrung out of hot water and snugly wrapped about the patient. In such cases, the application of cold might be fatal in its results. Cold applications are a very powerful therapeutic

means, and may do great damage instead of good when not properly applied.

Dr. E. C. Elliott, resident physician in the St. Agnes Hospital, Philadelphia, reports a reduction of mortality in that hospital from 26.6 per cent in 1889, and 24.6 per cent in 1890, to 6.5 per cent in 1891, after the adoption of the cold bath as a means of reducing temperature. J. H. K.

The Relation of the Will to the Passions.— A confirmed thirst for the use of alcoholic liquor is, at some period at least, evidently the result of a diseased condition. Though the desire for it may, for some cause or other, be formed at an early date, yet it is a very difficult thing to control without constant dietetic care, earnest efforts of the will, and all other means which our common Father has placed at the command of man. But that the organism may become so diseased by alcohol that the will loses control of some of the faculties, is evident to all who without any bias, and unmindful of theories or pet ideas, have observed the lives of drunkards closely, for the sake of arriving at the truth. There can be no question but that diet has a great influence on the character of man, and that by the different stimulating foods and beverages certain appetites are increased, and in some degree abnormal passions developed. No enlightened man can deny that man is an aggregation of living cells capable of being influenced individually and collectively by the nourishment of which they partake, or the material with which they are perforce brought in contact. Stimulating diets and exaggerated ingestions of food tend, by direct action on the cells and by the resultant effects on the nervous system and its faculties, to increase the appetites and lower the power of resistance.

P. P.

We were surprised to notice recently, in an Eastern medical journal, in an otherwise very able article by a talented writer and acute observer, directions for sterilizing catgut for surgical purposes which included among other measures the boiling of the catgut. Boiled catgut might make a very palatable broth in the absence of more wholesome food, but would scarcely do for the ligation of an artery. Silkworm-gut, as well as silk, stands boiling well, but catgut and kangaroo tendon cannot be sterilized by heat without rendering it useless for surgical purposes. We supposed everybody knew this. But perhaps the writer referred to did not mean what he said, or is the victim of a printer's error or a slip of the pen.

Micro-organisms and Alcohol in Digestion. — Unscientific minds, and those looking at the properties of alcohol from one point of view only, or, in other words, studying only one side of it, viz., the striking features of alcoholism, are not prepared to admit that, in so-called moderate quantities, it is harmful. The experiments which have been made in various countries, on the action of alcohol (or the various liquors containing alcohol), on the tissues of the body, all tend to prove that water is abstracted from the tissues with which it comes in contact, and that the substance composing the structure is more or less hardened. Under this influence, the stomach or intestines which receive a habitual quantity of alcohol, must be interfered with in their natural secretions necessary for digestion. As a consequence, the food that enters the alimentary canal fails of complete digestion; the digestible portions fail to be entirely transformed by the digestive fluids before being absorbed into the circulation, for assimilation. The micro-organisms of the mouth, the micro-organisms of the food, and the various kinds of ferment-producers that enter the digestive tract, then prey on the undigested portions that are in the organs, cause them to decompose, putrefy, and produce more or less poisonous or irritating products, such as ammonia, scatol, alcohol, etc., and doubtless some exceedingly toxic substances, such as ptomaines, tox-albumins, toxic proteids, etc,

etc. The effect, then, of microbes in an alimentary canal weakened by alcoholic beverages, is to produce not only dyspepsia, but auto-intoxication by the products of food-decomposition.

From this point of view, it seems to us unwise for doctors to prescribe so-called alcoholic stimulants in certain cases of dyspepsia. This is not the only reason or ground for rejecting this mode of treatment, but, from a bacteriological standpoint, it is a source of complication of a positive character not to be overlooked.

P. P.

REVIEWS.

The Microscope and Its Revelations. By Wm. B. Carpenter; 7th edition, with the first seven chapters entirely rewritten by the Rev. W. H. Dallinger, L. L. D., F. R. S., etc., with 21 plates and 800 wood engravings. Publishers, P. Blakiston, Son & Co., Philadelphia. This cyclopedia of information on matters pertaining to microscopy — for this book almost deserves the title of cyclopedia — is perhaps the most complete work of its kind in the English language. It is understood that the Rev. Dallinger has spent a great deal of time in editing this new edition. It was time well employed for the medical world, and all those interested directly or indirectly will reap great benefits from the contents of the new volume of over 1,000 pages. The illustrations are all good and the text clear. It is a splendid book.

Precis d' Analyse Microbiologique des Eaux. By Dr. Gabriel Roux, Director of the Municipal Bureau of Hygiene of the city of Lyons, France. Publishers, J. B. Baillère et Fils, 19 Rue Hautefeuille, Paris, France. A book of over 400 pages, containing the technical methods employed by the author in water analysis; also a summary of the diagnoses of the bacteria of water.

Both from a technical and from a scientific standpoint, this work is an admirable treatise. It is practical, concise, and condensed. It is illustrated by seventy-three good engravings representing apparatus and micro-organisms. Few books are more needed nowadays than good works on the subject treated by this one, and perhaps none on the market is better adapted to fill the want than it is. The great role that micro-organisms of water play in the causation of disease, makes it incumbent on the medical profession to study it more and oftener than before the properties of microbes were known; and notwithstanding the imperfections in the process of research on the subject, every truly meritorious book of this character should be hailed with delight. We are glad of the appearance of this excellent publication.

Consumption: How to Prevent it and How to Live with it. — By N. S. Davis, Jr., M. D.; Philadelphia, F. A. Davis. This little work is especially intended for the laity, as is indicated by the following from the author's preface: "I have found it difficult in brief conversations to impress upon consumptives the necessity of rigidly executing certain sanitary rules, whose fulfillment is essential to successful treatment of their disease. This is especially true of patients who live at a distance and are seldom seen. I therefore prepared for my patients a series of hygienic rules, with brief explanations of the effect of their execution. From these rules this small volume has grown. I find that treatment is not persistently pursued unless a patient fully appreciates the chronic character of consumption, and the need of advice and treatment for years, and especially when the disease is least active. Consumption is the greatest plague of our civilization. I have felt that the public should be better informed as to its nature and causes, for many of the latter can be avoided."

We heartily approve both of the purpose of the author in the preparation of this little work and the manner in which the purpose has been executed. The medical profession has been exceedingly remiss in duty in the matter of educating

the public respecting the prevention of chronic disease, and, as Dr. Davis puts it, "how to live with it." The majority of chronic invalids are incurable, in the strict sense of the word, and the best, and often the only thing that can be done for them is to teach them how to so adjust their habits in life as to keep in check the malady which may have in part disabled some vital organ, and ameliorate the sufferings and inconveniences growing out of the disease, as much as possible. Dr. Davis here presents the consumptive with a book which gives him exactly the information he ought to have, and which will doubtless be the means of saving many lives, and giving to many more whose lives have been to some extent blighted by an incurable malady, many years of comparatively comfortable and useful life. The nature and prevention of consumption, hygiene for the cousumptive, including a judicious consideration of the subject of climate, and the medicinal treatment of the disease, are among the interesting subjects which receive a practical and discriminate treatment by the author.

The little work ought to be in the hands of every consumptive, and if some one will now undertake the same task for a half dozen other chronic maladies, such as chronic dyspepsia, Bright's disease, and rheumatic gout, some progress will be made in the direction of popular medical education of the people, one of the crying needs of the times, and the only successful means of exterminating the greatest pests of the age — quackery and the patent-medicine business.

Nursing in Abdominal Surgery and Diseases of Women.— By Anna M. Fullerton, M. D.; Philadelphia. P. Blakiston Son & Co. This admirable little work fills a want which has heretofore not been met. The after-care of patients in abdominal surgery is a matter of almost as great importance as the operation itself. The great decrease in the fatality of abdominal operations which has been attained by Tait and his followers in recent years, is more attributable to the adoption of new methods in the after-care of patients than to modifications of operative procedures. This little book expresses the most approved views respecting the duties of the nurse in relation to the patient prior to, during, and after the operation. The directions given are plain and concise, and the result of wide observation and extended experience. Some surgeons, like the writer, require the contents of the bowels to be removed on the second rather than the third day. As a rule we should not wish to have ice-cold applications made to the head after abdominal operations, on account of the increased tendency to chill or shock which might be thereby produced.

This little book ought to be in the hands of every trained nurse who has anything to do with the care of abdominal or gynecological surgical cases.

Catalogue of Chemical and Physical Apparatus.— Henry Heil Chemical Co., St. Louis, Mo. This is truly a magnificent book, worthy of being on the shelf of every one who may need any kind of physical, chemical, bacteriological, or microscopical apparatus, scales, etc., etc., and scientific books and chemicals. It contains nearly 450 pages, and is profusely illustrated with cuts of all manner of scientific apparatus. A splendid feature of this catalogue is its perfect index to the thousands of articles it mentions and illustrates. Every college, university, laboratory, and all interested in scientific work, should procure a copy.

Practical Bacteriology.— By Thos. E. Satterthwaite, M. D.; Leisure Library. Geo. S. Davis, publisher, Detroit, Mich. This little book is what it claims to be, a practical treatise on bacteria for the use of medical men and others.

Practical Notes on Urine Analysis. By W. B. Canfield, M. D. Geo. S. Davis, publisher, Detroit, Mich. An excellent, condensed, practical treatise that may benefit every practitioner and will be found very useful for students.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., JANUARY, 1892.

CATGUT AND SILK LIGATURES.

IN our November number, an editorial appeared, giving the substance of experiments made by Klemm (*Bulletin Général de Thérapeutique*), concerning the infection of surgical wounds by catgut. These experiments, he states, developed the fact that catgut, though thoroughly sterilized when used, decomposes, and offers a medium for the development of germs, while silk has no such properties of disturbance. By request of the Superintendent of the Laboratory of Hygiene, the Director has undertaken a series of experiments with a view of verifying or disproving Klemm's assertions, and also with a view of establishing further what kind of catgut ligatures, if any, are perfectly sterile.

In the first place, cultures were made with eight different kinds of catgut, as follows:—

A. Chromated No. 1, Lister Manufacturing Co.

B. Turpentine or pine gum (?), manufactured by C. M. Ende.

C. Alcoholic medium (?), Myron E. Myer Manufacturing Co.

D. Surgeons' Chromic Acid, manufactured by Sharp & Smith.

E. Surgeons' Carbolic Acid, manufactured by Sharp & Smith.

F. Juniper, Lister Manufacturing Co.

G. Carbolized gut, manufactured by Seabury & Johnson.

H. Chromated No. 3, Lister Manufacturing Co.

In series No. 1, a bit of catgut from each of these specimens was snipped with a sterile pair of scissors, and dropped without washing into neutral liquid beef broth. In series No. 2, a bit of each specimen was washed in sterile water and dropped into sterilized beef broth. Thirty-two cultures were made, two of each kind, for each series. In the first series (No. 1), made with unwashed catgut, there was not a single growth of germs. In the second series (No. 2), two tubes developed growths, which, however, undoubtedly came from contamination while washing, because repeated cultures made afterward from the same catgut in the same way, produced no growth. So it is safe to conclude that all these specimens (which were old ones, and had been a long time in the sterilizing fluid) were perfectly sterile and all equally good from this standpoint.

Then a series of experiments were made upon two rabbits, as follows: With rabbit No. 1, the skin was washed thoroughly with soap and water on one side, and then with a weak solution, 1–5000 of bichloride of mercury. Four sterilized needles were threaded with ligatures A, B, C, and D respectively, and each was passed under the skin in the manner of sewing a wound, in the washed side of the rabbit. The extremities of these bits of catgut were tied together in the manner of sutures. Then four silk sutures which had been in the same solutions respectively as contained the catgut ligatures, for a period of seventy-two hours, were inserted likewise between each of the gut ligatures, thus making a row of eight ligatures of catgut and silk alternately, begining with the former and ending with the latter.

Precisely the same thing was done with rabbit No. 2 with catgut ligatures E, F, G and H, and silks which had been soaked in their respective fluids.

The result was as follows: At the end of the third day, the pus in each suture-cavity was studied. It was found that the number of micro-organisms in each of the catgut sutures was, in average, ten times larger than in the silk sutures, the number being greater in the cavity made by the largest caliber of catgut, and smaller with the finest kind. The quantity of the suppuration was greater in every case of catgut suture than in the silk sutures.

At the end of the fifth day, two of the catgut sutures, and two of the silk sutures of each rabbit were cut out; the cavities of each suture presented an increase of micro-organisms, but proportionately the same relation as shown by the first study of them. In studying the bits of ligature, it was found that the cat-

gut was softening and was harboring a number of germs; it seemed to furnish a pabulum for their growth, the larger specimens of suture being, in one or two instances, thoroughly impregnated with microbes. The silk suture was also impregnated with germs, although in a smaller quantity, and they were rather on the exterior of the thread than through it, as a washing in sterile water of both the catgut and of the latter demonstrated.

At the end of the eighth day, suppuration of the catgut was still continuing, but that of the finest kind of sutures used was much less than that of the coarsest, the latter being very profuse. In the silk ligatures, suppuration was slight; scarcely less, however, than that of the finest of the catgut. On this day, the two remaining catgut ligatures and silk ligatures in each rabbit were cut close to the body, at each extremity, leaving a portion of each inside of the skin; then the surface of the body was washed with bichloride of mercury, the pus pressed out, and the openings were washed as well as possible with a disinfectant.

On the ninth day, rabbit No. 1 died from infection developed from an œdema surrounding the inroad made by the largest of the catgut sutures left in. All the open suture wounds seemed normal, being in a nice way of healing. Each of the cavities where the bits of sutures had been left in the skin were split open, and in each case the pus of the catgut was more profuse than in that in the silk cavity, but in neither case was it very great. The finest gut threads had about liquefied and disappeared.

On the tenth day each wound of rabbit No. 2, which still contained a bit of suture inside, was split open. In one of the catgut cavities, quite a little abscess burrowing under the skin into the muscles had been formed. The catgut, a large one, was decomposed and almost liquefied, and on a microscopical examination presented a mass of microbes. The other, a small catgut thread, had been all destroyed, and had disappeared, and the wound was healing. One of the silk ligatures had been pulled out by accident, and the wound was practically closed. The other silk ligature was still inside of the skin; suppuration was slight.

The relative quantity of microbes, as presented by colonies on plate-culture, was as follows:—

Culture made on the fifth day from four different catgut ligatures developed 362, 568, 601, and 627 colonies respectively.

Four plate-cultures made from four different silk sutures in the same manner, with about equal proportions of material from a silk suture, developed 21, 28, 42, and 159 colonies respectively.

Cultures made on the tenth day in the same manner from catgut and the silk, gave about the same relative proportions of colonies in their growth, except one silk suture culture which developed 205. In no case of catgut ligature were the number of colonies below 300.

We conclude that Klemm is correct in his opinion that catgut should be excluded from surgical practice, and that the reason why more infection follows its use than in the use of silk, is that it offers pabulum for the development of germs. The catgut becomes moistened and softened in the tissues, both by the warmth and the natural liquid material, and offers, as soon as it is free from the disinfecting material (which gradually takes place, and seems complete about the third, fourth, or fifth day), a non-resisting medium for the development of micro-organisms; so they begin to grow at the expense of it, notwithstanding the living resistance of the tissues surrounding it.

In the case of the silk suture, it is only very slowly that the germs can develop, because they have to grow at the very outset at the expense of living tissues or their secretions, or at the expense of blood, the latter being usually the first pabulum for their development. They encounter from the very beginning more or less resistance from the animal cells and the microbicide fluids of the tissues, and it is only after they have succeeded in destroying some of the cells in their neighborhood, by the properties of their diastase and by the poisons which they generate, that they are capable of reproducing themselves in greater numbers and gradually infecting the wound. Klemm, in our opinion, is justified in rejecting catgut sutures and giving preference to silk.

BACTERIOLOGICAL STUDIES OF DR. KELLOGG'S ASEPTIC DRAINAGE-TUBE.

October 11, 1891, by request of Dr. Kellogg, Supt., the Director of the Laboratory, began a series of investigations concerning the nature of the material of the wounds of three patients lying in the Sanitarium Hospital, which were daily drained by means of a certain device which Dr. Kellogg has improvised. (See figures of the drainage-tubes, pages 106, 107.) The following is a brief account of the studies:—

Case 1. Abdominal opening of several inches (operation on uterus performed several days before by Dr. K.). Cultures A, B, C, of fluid

beef broth, beef and gelatine, and beef and agar-agar, respectively.

Material of inoculation of tube A was from the mouth of stationary drainage-tube. Remained sterile.

Tube B, material from inside walls of drainage-tube, remained sterile.

Tube C, from material drawn from the abdomen through drainage-tube (about ten drops used), remained sterile.

Case No. 2. Abdominal wound as case 1. Drainage-tube in position a few days.

Cultures D, E, F, of fluid beef, beef and gelatine, and beef and agar, respectively. The culture made and methods of inoculation and origin of material were in every respect the same as for case 1, and the results were likewise negative.

The last syringe-full of serous fluid drawn from this wound through drainage-tube, was carried to the laboratory, and six beef broth tubes and four agar-agar tubes were inoculated. One of the latter developed, after two days, at a temperature of 80° F., one single colony of staphylococcus pyogenes aureus. It began with a very fine point, as if but a single germ had been inoculated.

Case No. 3. Abdominal wound from surgical operation similar to the first two cases. Made two cultures, G and H, liquid beef, and gelatine and beef, respectively. G was inoculated from material from inside the mouth and edges of the mouth of drainage-tube. It presented after thirty six hours (at 80° F.) the staphylococcus pyogenes aureus in small numbers, and a few bacilli.

H, inoculated with material from inside walls of body of tube, also presented, after thirty-six hours, a few cocci. Fluid brought to laboratory and analyzed microscopically failed to reveal any germs, but on making a plate culture, it developed, in four furrows made crosswise with the inoculatius wire, ten colonies of cocci and no bacilli, from which we may conclude that the bacilli seen in previous cultures were from contamination in manipulations.

Dr. Kellogg had predicted, for some certain reasons pertaining to some irregularity, that this case would reveal more impurity than the other, and it proved to be the case.

Further Experiments With Vaccine. — Since the last issue of the BACTERIOLOGICAL WORLD, we have to report the result of a series of experiments undertaken to enlighten us on the following points: 1. What degree and what kind (generally speaking) of microbic contaminations of vaccine are dangerous. 2. Are the air germs which fall on the pure vaccinia pustules when dipping the points, sufficiently numerous to be considered harmful?

Series A. Commercial vaccine crust bought in the market, presenting by culture five species of microbes, three of which were capable, when isolated and in sufficient numbers, to cause various disturbances ranging from local abscesses and œdema to general septicæmia and death. A particle as large as a pea was crushed in a clean sterile watch-glass in sixty minims of sterile distilled water, with a sterile glass rod. After mashing, standing, and macerating an hour, protected from air impurities, in a cool place, six rabbits were inoculated with eight drops each hypodermically at the side. Every one developed a swelling, one an abscess, one a diffused œdema, and one a hard enlargement which lasted several days.

Series B. Vaccine crust developed purposely in the most cleanly manner on the white tegument of a very healthy calf. Culture developed one pus germ and two harmless ones. A bit of crust, size of a pea, was mashed and macerated as in series A, for an hour in a cool place. Six rabbits were inoculated hypodermically at the side (flank) with eight drops each. Four developed noticeable swellings, two of which were somewhat diffused, one of the two forming a small abscess. Two rabbits had small enlargements barely perceptible by careful digital examination.

Series C. Five vaccine points of commerce, showing by culture three kinds of foreign germs, of which one was pathogenic, were placed in 60 minims sterile distilled water, and allowed to remain an hour in a cool place. Microscopical analysis of five other points of this same package (evidently from the same crop) demonstrated but few foreign germs to each point. Eight drops from the liquid well shaken, were inoculated hypodermically into each of six rabbits. Two developed a swelling readily noticeable, and one of these a diffused œdema radiating two inches from the point of inoculation. One of the others had a barely noticeable enlargement at the point of inoculation.

Series D. Five vaccine points having been dipped *twice* in same pustules one day apart; *i. e.*, second dipping one day after the first, by removing the second scab, as is frequently done by commercial establishments. The crop was cultivated with care on a healthy calf, and all the manipulations done in as cleanly a manner as possible. Microscopical analysis and cultures after the first dipping developed two harmless air germs. Five points were dropped in a dram of sterile distilled water after the *first* dipping, and soaked for an hour in a cool place. Six rabbits inoculated with eight drops each of

this fluid failed to produce any enlargement except a slight inflammatory action at the point of inoculation, which disappeared early. It may have been induced partly by the vaccinia cocci; but there were no pronounced effects as in case of inoculation of more impure virus. After the second dipping, the vaccine points contained three kinds of pathogenic bacteria. Five points were soaked an hour at cool temperature in a dram of sterile distilled water. Eight drops were inoculated hypodermically into each of six rabbits, and three of them developed marked enlargements, and one a slight abscess. The other three remained practically intact. It will be observed that under the scabs of the pustules at this second dipping, there was considerable pus (often mistaken for pure coagulated vaccine lymph), and pus germs almost as numerous as in an artificial culture. All this was wiped off as clean as could be done with a clean cloth and sponge, but evidently many of the microbes remained notwithstanding the cleansing.

Series E. Ten vaccine points from vaccine produced with the greatest care. By cultures and microscopical examination, these points demonstrated but two kinds of foreign germs and very few in number. One was a pus germ —the staphylococcus pyogenes aureus. Five points were put in one dram of sterile distilled water in a test-tube (No. 1), and the five others in one dram of sterile water in another tube (No. 2). The first virus (tube 1) was inoculated in doses of eight drops each into six rabbits. Only one presented a characteristic swelling —an enlargement with slight diffusion. The other presented little or no disturbance.

The virus of tube No. 2 was inoculated after remaining in the sterile water for six hours at a warm temperature. The liquid by this time was very turbid; inoculations of eight drops each into six rabbits developed marked enlargements in four, among which one abscess was formed, and one death occurred. The other two rabbits had slight enlargements which subsided in a few days.

Conclusions:—

1. The degree of purity of virus is in ratio with the number and kind of foreign germs it contains—the fewer they are in number, their specific property considered, the safer it is.

2. Air germs that fall on points and in pustules while charging the former, providing the air is as pure as it can be made, and all the antiseptic precautions necessary be taken, are not sufficient to make the virus dangerous to use.

3. Comparatively safe vaccine may, naturally, be made impure and dangerous by allowing it to remain in water at a warm temperature.

TECHNIQUE.

To Mount Cover-Glass Preparations in Canada Balsam. — Most of those who use a microscope have perhaps been taught different methods of applying the Canada balsam to the slide and cover-glass, but in the majority of cases the method in vogue is to drop a little balsam on the upper surface of the slide held horizontally, or on the face of the cover-glass preparation, and then stick the two together as near as possible to the center of the slide. The inconveniences of this method are as follows: In the first place, it is difficult to center the balsam, thoroughly, because the fingers holding the balsam are in the way of vision, and the drop is often larger than necessary, or is not centered well. Again: by this method the Canada balsam is turned upward for a time, and frequently until the cover-glass is applied, and dusts from the air which fall on it adhere and remain in the mount. The Director of this Laboratory has long since employed the following method: Taking the clean slide with the left hand,—the thumb and the index-finger holding it in a horizontal position about opposite the chest, so he can look through the glass downward,— he takes a tube of filtered Canada balsam such as we have in the market, and presses very gently a small drop in the center of the slide on its under surface. By this means he can see the drop coming out of the balsam tube up to the slide, and he can center it as exactly as his eyes can measure, and can make it as large or as small as he pleases, and all the time the balsam is protected from the falling dusts of the room. The balsam being on under surface of the slide, it is then laid down, the balsam downward, with one end resting on something, making an angle between the slide and the table, to prevent the balsam from touching. Thus it is protected from flying dust until ready for use.

When the cover-glass preparation is ready (that is, when it is ready to be applied to the balsam), it is laid on a paper, smeared face upward, and taking up the slide, one end between the thumb and index-finger of the left hand, and the other end between the index-finger and thumb of the right hand, he applies it on the upturned face of the cover-glass. He is thus enabled to see the cover-glass through the slide, and can center it much better than if the slide was turned upward and cover-glass dropped on it. This being done, he reverses the slide, and with the cover-glass upward, passes it to and fro over the blaze of a lamp or a gas-jet until sufficiently cooked, if specimens will permit.

BULLETIN OF THE

MEDICAL AND SURGICAL SANITARIUM,

BATTLE CREEK, MICHIGAN.

THE purpose of this department is to constitute, together with the Bulletin of the Laboratory of Hygiene, a record of the scientific work in the Medical and Surgical Sanitarium located at Battle Creek, Michigan, an institution incorporated as an organized and self-supporting charitable enterprise, all the earnings of the institution being devoted to charitable and medica work, and the advancement of scientific medicine.

ANTISEPTIC DRAINAGE IN ABDOMINAL SURGERY.

THERE has recently been much discussion among gynecological surgeons regarding the best methods of securing complete asepsis in connection with drainage after laparotomies. Various methods have been proposed, the chief of which are the following:—

1. Filling the drainage-tube with gauze, allowing the fluids to drain out by capillary action.

2. Avoiding the use of the syringe for evacuating fluids, and removing the fluid by forceps and bits of cotton passed down the drainage-tube (Kelley's method).

3. The use of a piece of twisted gauze as a capillary drain, without using the glass tube.

The evident purpose of these suggestions is to avoid something, by means of which the fluids of the abdomen have heretofore been so likely to become infected that it has by the best operators been considered hazardous to leave the tube in place more than two or three days.

Lawson Tait told the writer two years ago that the drainage-tube gave him more anxiety and trouble than any other one matter connected with abdominal surgery. When the drainage-tube was left in more than two or three days, if managed in the ordinary way, the accumulating fluids being evacuated by some sort of suction apparatus, the fluids almost invariably became turbid by the development of bacteria of various sorts; and suppuration, likely to be followed by a fistula or slow healing of the wound, was almost certain to result.

In their efforts to secure asepsis in connection with the drainage tube, various experimenters who have sought to solve the problem, have not, so far as I can learn from reading the reports of their results, a clear idea of the real cause of the infection through the drainage-tube. Some have entertained the idea that the microbes gradually found their way down the tube by a growth along its inside surface. Others have believed that a similar growth took place along the outside surface of the tube.

In the opinion of the writer, neither of these suppositions recognizes the true source of infection, except in certain cases in which there has been gross neglect of asepsis in the dressing of the wound at the time of operation, or in its after management.

A simple experiment will convince any one of the real source of infection when the drainage-tube is evacuated by suction. Take a bottle, fill it two thirds full of fluid, and pass into it a drainage-tube through a perforated rubber cork. The drainage-tube should be introduced sufficiently to submerge all the lateral openings of the tube. Now draw out some of the fluid from the bottle by means of any of the suction appliances used for the purpose, and note the result. It will be observed that as soon as suction begins, the fluid in the tube begins to sink below the common level of the fluid in the bottle. It continues to fall until it reaches one of the lateral openings or the bottom of the tube, if the suction is strong. It will then be observed that several bubbles of air escape from the tube into the surrounding liquid and pass up into the air space of the bottle, external to the drainage-tube. A momentary consideration of the conditions present will show the absolute necessity of this action. The mouth of the bottle being tightly closed, it is evident that no fluid except that in the tube itself can be evacuated from the bottle without the admission of an equal amount of air; that is, for every ounce of water taken from the bottle, an ounce of air must be admitted. The air is drawn down the drainage-tube, and passes up into the interior of the bottle outside of it.

This is precisely what happens in the evacuation of fluid through a drainage-tube placed in the abdomen, when the same means is employed. Whatever quantity of fluid is withdrawn, an equal amount of air, carrying its load of germs of various sorts, enters the drainage-tube and passes out into the abdominal cavity. It should be noticed, also, that the current of air which is drawn into the tube is concentrated upon the tissues which lie

about the lower end of the drainage-tube. The fluid which is being drawn out doubtless carries away with it a large share of the germs introduced, but as the air bubbles up into the abdominal cavity, many germs must be carried with it.

The writer became convinced more than two years ago that this is the very method by which infection occurs in the use of the drainage-tube, and set about devising means to prevent it. The first method employed was to plug the mouth of the drainage-tube, after introducing the rubber tube of the evacuating syringe, with cotton, so that all the air which entered the tube as the fluid was evacuated, would be filtered through the cotton. This method, if carefully managed, is really efficient, but as a more positive and certain method, I arranged a simple device which is shown in the accompanying cut. It consists, as will be seen, of the following parts: *A*, the cotton filter—a simple thistle tube filled with cotton and covered with sheet lint. *B*, a wash bottle. *C*, a drainage-tube precisely like an ordinary drainage-tube, except that it has a lateral opening leading into a small short tube near its upper end. *D*, an ordinary evacuating syringe, the tube of which passes through a rubber cork by which the upper end of the drainage-tube is closed while the fluid is being drawn out. The working of this device will be readily understood. As the fluid is drawn into the evacuating syringe, air is drawn down through the cotton filter, bubbles up through the wash bottle, passes through the rubber tube into the drainage-tube outside the rubber tube through which the fluid is evacuated. By this means the air which enters the drainage-tube is thoroughly filtered.



FIG. 1.

This device, or some modification of it, I have employed for the last year and a half with excellent results. In one case the drainage-tube was kept in ten days without the appearance of any turbidity of the evacuated fluid. Two or three days later, however, the fluid became slightly turbid through neglect of the necessary aseptic precautions on the part of the nurse. In another case, where the tube was kept in place four days, very careful bacteriological examinations were made by Prof. Paquin, Director of the Laboratory of Hygiene. Examinations were made of the outer surface of the tube, the inner surface, and of the fluid evacuated. No growths of any sort appeared.

In a laboratory experiment, in which a flask was made to represent the abdominal cavity, and bouillon the fluid to be evacuated, the fluid remained perfectly sterile during two weeks, although a portion of the fluid was daily evacuated by means of the device above described. The fluid finally became infected by accident, through the apparatus being accidentally disturbed.

Figs. 2, 3, and 4 indicate forms of the device which are equally efficient. In No. 2, the lateral tube is avoided, both tubes passing through the cork. The tube for the admission of air is indicated larger than is necessary, and the evacuating tube smaller. In Fig. 3, the thistle-tube containing the cotton is connected directly with the drainage-tube, instead of with the wash-bottle. If the apparatus is carefully used, this method is equally effective with

the arrangement in which the wash-bottle was employed. The principal advantage of the wash-bottle is to indicate that the apparatus is working perfectly, and that no air enters which does not pass through the filter. The fluid contained in the wash-bottle is a mixture of chloroform, alcohol, and glycerine. One advantage of the wash-bottle is that the air which enters the abdominal cavity is charged with the odor of chloroform, which is a powerful antiseptic.

Fig. 4 shows the simple method which I first employed, and which, by the exercise of great care, may be perfectly effective. The perforated tube is simply surrounded by cotton at the mouth of the drainage-tube, the cotton being sufficiently packed to secure proper filtration of the air. In employing any of these devices it is necessary to disconnect the syringe each time it is filled. A few points should be mentioned respecting the care of the drainage-tube and the device for evacuating the fluid:—

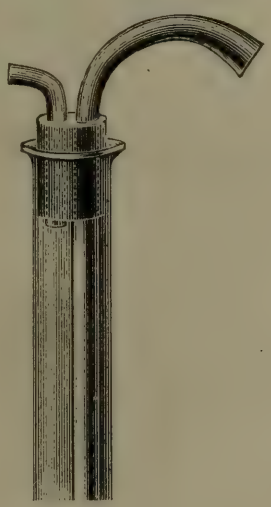


Fig. 2.

In dressing the wound the drainage-tube is surrounded with moist gauze heavily loaded with iodoform. The drainge-tube is lightly plugged with cotton wet in 1-1000 bi-chloride solution. A broad piece of sheet rubber is slipped over the upper end of the drainage-tube, as practiced by Thornton, of London. The evacuating syringe and tube are kept immersed in a 1-1000 bi-chloride solution. When the evacuating device is to be used, the hands are first sterilized as for a surgical operation. While handling the evacuating apparatus, the hands are kept wet with the 1-1000 bi-chloride solution, so that if any germs be found lingering upon the fingers, and left behind upon the drainage-tube, an efficient antidote will be left with them.

This device may seem somewhat complicated, and its use troublesome. This is not the case, however, and after once becoming accustomed to its use, scarcely more time is required than in the employment of the ordinary means.

The objections to which the other methods referred to as having been proposed appear to us to be open, are as follows:—

1. When the drainage-tube is plugged with gauze, the lower end of the plug, as Dr. Joseph Price has very well observed, becomes almost impervious to fluids and the coagulation of fiber, so the plug is really a very inefficient drain.

Another disadvantage of this method is that fragments of dèbris and clots which are frequently removed when the suction method is employed, are left behind and serve as a nidus for the development of microbes and a starting point for inflammatory processes. It is sometimes impossible to remove every particle of detritus in certain cases, even by washing the abdominal cavity in the most thorough manner. These articles gravitate down to the drainage-tube and by the suction method may be drawn out, but are almost certain to be left behind when the tube is filled with the gauze plug, although now and then some small particle may be found adhering to the end of the plug when it is drawn out.

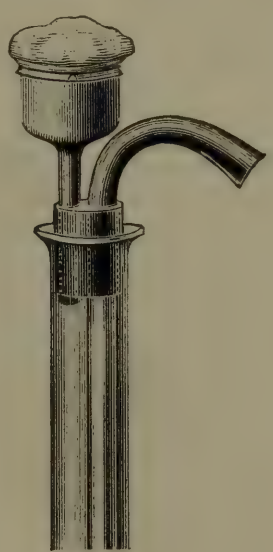


Fig. 3.

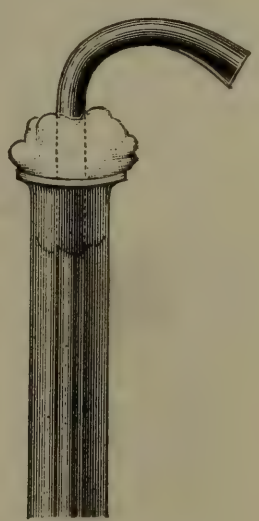


Fig. 4.

The suction method has, undoubtedly, some influence in drawing in the fluid from the territory surrounding the end of the tube, while the capillary drain is compelled to act against gravity, and when large tumors have been removed, does not have the assistance of the abdominal tension, which, if normal in degree, might in many cases render this method of drainage quite efficient.

Dr. Kelly's method is exceeding tedious, and has many of the same disadvantages as the gauze plug, since it does not remove the detritus and does not draw in fluids which may be lying in the neighborhood of the tube, but which are prevented from freely gravitating toward it by the close contiguity of the intestinal folds.

This method offers another disadvantage which appears to us to be very considerable. The passing in of many plugs of cotton, one after another, might serve to pump in a large quantity of germ-laden air, and this would fa-

cilitate infection. Nevertheless, the bacteriological studies made in connection with Dr. Kelly's method showed very good results, although in several instances infection did occur.

The gauze drain is certainly open to many serious objections. It may first be objected to on the grounds mentioned with reference to the gauze plug for the glass drainage-tube. In addition, it is liable to become misplaced. There must certainly be very great danger of displacement of the lower end, so that one cannot be confident that the drain reaches to the lowest part of the abdominal cavity, or that it has remained where placed at the time of the operation.

One is often in doubt as to whether the drainage-tube should or should not be employed. The rule laid down by Tait has been, When in doubt, drain. Nevertheless, the inconveniences and dangers of the drainage-tube when employed in the usual manner, must lead many times to a decision to omit its use, even when on some accounts its employment would be very desirable. If the surgeon could feel that the drainage-tube could be employed with perfect safety, and without any danger whatever of infection, or delay in the healing of the wound, he would certainly employ it more frequently than he otherwise would, and in so doing would sometimes avoid disaster to his patient and disappointment to himself.

In the Bulletin of the Laboratory of Hygiene for this month will be found a detailed account of the bacteriological observations in connection with the device described in this article.

J. H. K.

THE VALUE AND USE OF INHALATIONS IN THE TREATMENT OF DISEASES OF THE RESPIRATORY ORGANS.

BY H. M. DUNLAP, M. D.
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WHAT constitutes the best method of treating diseases of the respiratory organs, is a question which should occupy a large place in the minds of all medical men. There is no other class of diseases so prevalent, nor so fruitful in the destruction of human life. Statistics bear us out in this. It is true that much attention has been given to the consideration of tuberculosis, its etiology and pathology, and within the last few years many have labored to discover some new remedy which should be a specific in all cases. As a result, many poor victims of this disease have undergone experimentation with hydrogen sulphide gas, Weigart's hot air apparatus, and various other medical fads, until finally Koch's tuberculine created universal excitement, but like all the other panaceas has also practically fallen out of use.

All of these efforts are commendable, notwithstanding their failure as panaceas; and if the desired end could be attained, it would yield one of the greatest blessings ever bestowed on humanity. In this, as in other lines of work, there is danger that, in our efforts to accomplish a great good, our minds shall be drawn away from some of the smaller everyday matters, which are consequently neglected; yet these, if faithfully attended to, might in the end yield a more abundant harvest of good. Thus, in the effort to discover a cure for pulmonary tuberculosis after it has become developed as such, we are in danger of neglecting some of the supposed less important conditions which may in reality be the recruiting agents which help to fill the ranks with new victims of this formidable malady. This is true in a special sense when we consider the many pulmonary complications of *la grippe*, which seems to have become an annual visitor.

Would it not be well, then, to consider whether we are making the best use of many of the old remedies, and whether we are employing the best methods for their administration? To my mind, there is much room for improvement in the old methods generally employed, not only in tuberculosis and those diseases which tend more directly to favor its production, but also in nearly all diseases of the respiratory organs, including the entire tract from its beginning in the nasal passages, to its end in the air cells and lung tissue surrounding them. I have given considerable attention to the treatment of diseases of the respiratory apparatus by means of local applications directly to the part affected. I have not been able to discover any good reason why we should not treat diseases of this class on exactly the same principles that we employ in disease of other parts of the body. It is not impossible, nor even difficult, to bring medicinal agents directly in contact with every part of the mucous membrane of the air passages, not excepting the frontal sinuses and other cavities communicating with the nasal cavity. In the treatment of those cases in which the mucous and submucous tissues are involved, whether acute or chronic, there are two essential points on which success depends:—

1. Whatever agent is used must reach every part involved.

2. Its action on the tissues must be maintained as constantly as possible.

The first depends on the method of administration, the second, on the frequency of application, and the character of the agent employed.

I have obtained far better results by the frequent use of mild, soothing, and protecting remedies, than by the use of the harsh and irritating sprays formerly so strongly advocated by many writers. I find this principle applies



Fig. 1.

equally well in the treatment of each region of the respiratory tract. Of course, in the throat and nose we must use the necessary surgical measures in those cases requiring them, but aside from this I use only non-irritating agents, and those which are absorbed slowly. The petroleum product now on the market under various names, such as "lavoline," liquid alboline, glymol, etc., I find very valuable, many useful agents being readily soluble in it. I have, however, in a very large number of cases obtained the most satisfactory result from the use of balsamic solutions, variously constituted. I find that quite a large number of drugs can be applied in solutions of this character. When a very fine spray of these solutions is inhaled, the balsam is deposited on the mucous membrane, owing to its moist condition which occasions the precipitation of the balsam, and is slowly absorbed. Thus the effect of all the constituents of the solution is prolonged far beyond that which can be obtained in any other way. In acute cases, I have the inhalations taken once an hour or once in two hours; in chronic cases, four to six times daily. This, of course, renders it necessary that the patient be able to administer the inhalations himself.

It is as necessary to have the proper means for administration as it is to have the proper remedy to administer. A great variety of apparatus have been designed for this purpose, from the simple inhaler to the most complicated and expensive instruments. I have experimented with a great many of them. Some are entirely inefficient, many are not durable, and many are so complicated and expensive that they can only be used in office treatment. For general purposes, I have found the class known as nebulizers the most desirable. Not finding an instrument which fulfilled all the conditions which I deemed necessary, I have had one constructed after my own design, of which the accompanying cut (Fig. 1) is an illustration. It consists of a strong bottle to the top of which, by means of a metal collar, is firmly secured a hard rubber cap, from the side of which project three horizontal tubes of hard rubber, one for the attachment of bulb, one for the inhaling mask, and the third acting as an inlet to the air when inhaled. To the under side of cap, and communicating with bulb, is attached a hard rubber spraying tube which reaches to near the bottom of bottle. As shown in cut (Fig. 2) it consists of three parts which are detachable, and therefore may be cleaned with the greatest facility, and admits of the use of any kind of solution. This alone enables us to use the balsam solutions. The spray is driven against the side of the bottle, where it breaks into a fine cloud which will float in the air for a long time. This very fine spray may be inhaled through the mask without the slightest laryngial irritation, and has been demonstrated to reach the air cells of the lungs, and if taken through the nose every part of the respiratory tract is reached.

By using the nasal tube in place of the mask and closing the inlet tube with the cork, the medicated air can be forced into middle ear, frontal sinuses, and other cavities, thus being of great value in many cases of catarrh, both acute and chronic. All parts are practically indestructible, and owing to the simplicity of

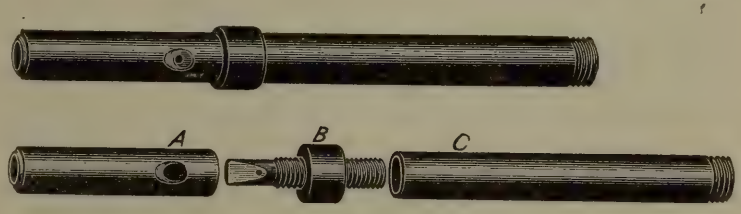


Fig. 2.

construction and application, it may be used by the patient at home, under his doctor's direction, without any difficulty, thus admitting of frequent application, upon the therapeutic importance of which too much cannot be said.

The following are a few of the formulæ which have given excellent results, applied by the above method:—

FORMULA NO. 1.

℞ Oil Scotch Pine.....gtt. x.
Oil Cinnamon.....gtt. x.
Oil Bay.....gtt. x.
Oil Eucalyptus.....gtt. xxx.
Menthol Crystals.....gr. x.
Tr. Benzoin.....ozs. ii.
ms. et. sig: to be used with nebulizer.

The above formula I have used in many cases of subacute and chronic catarrh with very satisfactory results, when used with sufficient frequency. I also use it largely as a base for other solutions.

℞ Cocaine Muriate.....grs. x.
Sol. No. 1.....ozs. ii.
ms.

This is valuable in the first or congestive stage of acute inflammations.

℞ Creosote (pure beechwood).....m. xx.
Sol. No. 1.....oz. i.
ms.

This formula gives good results in cases of pulmonary or laryngial tuberculosis, in conjunction with creosote enemata, as recommended in a recent number of this journal. This seems to me to be one of the most rational methods of treating this disease, and is highly recommended by many of the leading French physicians.

In cases where there is an excessive amount of secretion, either of the nasal or bronchial mucous membrane, I have found the following very useful:—

℞ Balsam of Peru.....drs. ii.
Oil Copaiba.....m xx.
Sol. No. 1.....dr. i.
ms.

For hay fever I use the following:—

℞ Cocaine Muriate.....grs. x.
Quinia Sulph.....grs. xx.
Alcohol.....gr. i.
Acid Hydrochlorine.....gtt. x.
Sol. No. 1.....ozs. ii.

Dissolve the quinia in the alcohol and acid, then add the other ingredients.

The above are samples of solutions having a balsamic base. Many other valuable combinations might be suggested. Almost any of the tinctures and fluid extracts may be used with the above instrument.

For example:—

℞ Tr. Stramonium.....dr. i.
Tr. Lobelia.....
Tr. Ipecac.....a a drs. ii.
Tr. Opii Camphor.....qs. ozs. iii.
ms.

Very prompt relief in attacks of spasmodic asthma, follow the use of the above.

As examples of solutions with the petroleum oils, we have the following:—

℞ Oil Cinnamon.....gtt. xx.
Oil Eucalyptus.....drs. ii.
Oil Wintergreen.....gtt. xxx.
Menthol Crystals.....grs. xxx.
Liquid Alboline.....ozs. iii.
ms.

℞ Camphor.....
Menthol.....a a

Rub in mortar until liquefied; make a 10 to 20 per cent solution in alboline.

The above formulæ give some idea of the variety of medicinal agents which may be applied directly to the affected parts; in fact any substance which is soluble in either alcohol, oil, or water, may be used.

BIENNIAL REPORT OF THE MEDICAL SUPERINTENDENT.

(Continued.)

MEDICAL DIETETICS.

FROM the very founding of this institution, the subject of diet has received large consideration as a remedial measure. Indeed, one of the purposes of the founders of the Institution was to provide the means for the careful study of dietetics from a practical standpoint, and to furnish the different classes of invalids with food suited to their special requirements.

Twenty-five years ago, at the beginning of this enterprise, such an attempt was looked upon as at least wholly unnecessary and uncalled for, if not discreditable, by the great majority of physicians, since many of the most eminent medical authorities almost wholly ignored the subject of diet in the treatment of the sick. Those who, like the writer, were special pupils with the late Austin Flint, Sr., or who sat under his teaching at Bellevue Hospital College, will recall the remark not infrequently made by this distinguished physician and teacher—one who at that time represented the foremost medical thought of this country, if not of the age—which fairly illustrates the state of medical opinion on the subject of dietetics at that time. Said the Professor: "If a dyspeptic says to you, Doctor, what shall I eat? when shall I eat? and how much shall I eat? say to him in reply, Eat what you please, eat when you are hungry, and eat until your hunger is satisfied." Doubtless such advice, which at the present day seems in the highest degree absurd and antagonistic to scientific medicine, was at that time practically as good for the patient

as would have been a carefully prepared bill of fare, since medical dietetics was at that time almost an unknown science, and he could scarcely have obtained wholesome foods had they been ordered. The preparation of eggnog, beef tea, and nauseating panadas practically exhausted the skill even of the trained nurse in the preparation of special foods for invalids; and, as a rule, the articles of food set before the average invalid were such as would in almost any case have laid the sick man's cook under suspicion of conspiracy against his life, if he had not been known to be a well-meaning friend instead of an enemy, although, alas, sadly astray in his manifestation of friendship.

Through the labors of Bouchard, Dujardin Beaumetz, Leube, and other French and German investigators, there has been in the last dozen years such a flood of light thrown upon the process of digestion and its disorders that at the present time there may be said to be a real science of dietetics; and a physician who has given the subject a sufficient amount of study, may now prepare for his patient a dietetic formula with almost the same precision, and with better grounds for positive expectation as regards results, than in the preparation of his medicinal prescriptions.

Notwithstanding this fact, however, the sick man still suffers for the want of means for carrying out the prescription of a wise and intelligent physician. The developments of the last few years have shown that a most important relation exists between the various forms of digestive disorders and chronic diseases of the kidneys, liver, lungs, mind, nerves, and, in fact, every organ and tissue in the body. Diabetes, Bright's disease, biliousness, neurasthenia, and hysteria as frequently require careful adjustment of the dietary to a patient's nutritive wants, as do the myriad forms of diseases heretofore recognized and promiscuously classed as dyspepsia.

The studies of Bouchard upon the toxic properties of the various excretions of the body, especially the urine, bile, and fecal matters, and his discovery that the greater part of the poisonous ptomaines upon which these toxic properties depend, are generated by microbes in the alimentary canal, are of almost startling importance in their relation to the dietetic treatment of disease, since it has been clearly shown that the quantity of ptomaines developed in the alimentary canal may be regulated almost to a nicety by control of the regimen of the patient, with the exception, of course, of cases in which the body is invaded by such virulent and tenacious, but fortunately short-lived microbes as those which constitute the specific cause of typhoid fever, cholera, etc.; and even in these maladies the regulation of the diet is a matter of utmost importance, as by this means the quantity of ptomaines produced, and consequently the intensity of the systemic poisoning, may be diminished in a notable degree.

The key-note of the dietetic treatment in a host of maladies was struck by Bouchard in the formulation of the term "intestinal asepsis." Clear the alimentary canal of germs, rid it of toxic ptomaines, and the host of maladies remote from the organs of digestion, and apparently not intimately related to them, as well as almost all known digestive disorders, will quickly disappear. The conditions of human life do not render complete asepsis possible, but by an intelligent and scientific management of the dietary, this condition may be approached so closely that under the favorable conditions secured by the highest attainable degree of asepsis, the vital forces will often rally with remarkable rapidity, and the system throw off the yoke of a chronic malady in a manner apparently marvelous and inexplicable, although previously, under methods which ignored the important relation of diet to an aseptic state of the stomach and intestines, no progress has been made.

As before remarked, medical dietetics has been for many years made a careful study and a subject of experimentation in this Institution, and every case is studied carefully with reference to the possible relation of dietetic errors, and the want of accurate adjustment of the kind or amount of food taken, to the nutritive demands of the body.

A careful physical examination is made of the stomach by means by which the size and location of the stomach are determined with very considerable accuracy, and such chemical and other tests are made as will determine the functional activity of the stomach, not only as regards the secretion of gastric juice but also as regards muscular activity. In all cases requiring it, the contents of the stomach are submitted to careful microscopical and chemical examination. These facts added to the history elicited from the patient, furnish a foundation for the preparation of the dietetic prescription, which it is presumed, at least, should be better adapted to the wants of the patient than the bill of fare made up by himself in his blind attempts to reconcile his digestive organs to the insults which are presented to them in the mixture which constitutes the greater part of the ordinary bill of fare.

The Diet Kitchen.—In order to supply the necessarily varied demands of a large number

of invalids, a diet kitchen with skilled cooks who have been especially trained in the preparation of food for invalids is absolutely essential. Quite a little army of persons are thus employed continually at the Sanitarium in meeting the wants of three or four hundred guests, whose varied conditions and fickle appetites can only be met by the most skillful catering. The regulation bill of fare of the average health-resort, hotel, or boarding-house, is, to say the least, illy adapted to suit the gustatory and alimentary wants of the average invalid. Indeed, the Israelites had no more difficult task in their efforts to make bricks without straw than has the stomach—especially an invalid stomach—in the effort to make good blood, brains, nerves, bones, and muscles, out of fried ham, Saratoga chips, *pâté de foie gras*, Welsh rarebit, pickled tripe, Worcester sauce, mince pie, cold tea, and ice-cream.

There is indeed but a small proportion of the articles offered on the ordinary hotel or boarding-house bill of fare—indeed we might include the *menu* of the great majority of private families—which the invalid suffering with a real serious stomach disorder could venture to eat, without taking his life in his hands. The articles named above, and others equally detestable to the undepraved taste and equally destructive to good digestion, never appear on the Sanitarium bill of fare; but our *menu* always offers a great variety of wholesome, well-cooked, and daintily served articles suitable for persons in health, and, in addition, a large variety of tempting articles prepared especially for the needs of a mixed multitude of invalids. The following is a sample bill of fare, neither better nor worse than what is encountered by patients at the Sanitarium table every day in the year:—

SANITARIUM MENU

Friday, Sept. 4, 1891.

DINNER

SOUPS

Pea and Tomato Potato

MEATS

Roast Mutton Baked Fish Beefsteak

VEGETABLES

Mashed Potato Egg Macaroni Scalloped Tomatoes
Stewed Celery

BEVERAGES

Caramel Coffee Milk

BREADS

Graham Bread Corn Bread Patent Flour Bread
Plain Oatmeal Crackers Graham Crackers
Toasted Whole-Wheat Wafers Patent Flour Crackers
Granola Oatmeal Biscuit Wheatena
Cream Toast Zwieback Dyspeptic Wafers

GRAINS

Pearl Wheat Graham Grits Rice

SAUCES

Strawberries Pears Black Raspberries

DESSERTS

Melon Apples Farina Blancmange

In addition to the general table, what are known as diet-tables are provided, at which a great variety of extra dishes are furnished. The following list represents the extra dishes furnished at the diet-table on the above date:—

Cream barley soup, green corn pulp, plum porridge, Graham grits, avenola, granola, dry gluten, corn meal gruel, vegetable broth, gluten gruel, cream, prunes, lemon apples, and pears.

An equal number of dishes is furnished every day, the list being changed, day by day, for variety. The patients at the diet-tables are assisted in the selection of their foods by means of the diet-lists in which the various foods, several hundred in number, which are furnished at the diet-table, are classified, the various classes being designated by numbers or letters. For example, the following is Diet-list No. 1, which contains articles allowed to patients who are taking a strictly milk diet.

Diet-list No. 1 is as follows: Milk, hot milk, boiled milk, sterilized milk, cream, junket, buttermilk, milk with lime water, cream with lime water, koumiss, malted milk.

Diet-list No. 2 contains dishes into the composition of which enter milk, eggs, and grains. Diet-list No. 3 consists of dishes wholly composed of fruits and grains. Diet-lists Nos. 4 and 5 contain more complex dishes, and such as require more vigorous digestion.

Diet-list A is wholly composed of unfermented breads, as follows: Toasted cream rolls, zwieback, corn puffs, whole-wheat puffs, Graham gems, whole-wheat gems, blueberry gems, rolls, sticks, crisps, Graham flakes, fruit rolls, beaten biscuit, gluten wafers, whole-wheat wafers, Graham crackers, fig sandwich, apple sandwich, hoe-cake.

Diet-list B is made up of fermented breads. Diet-list E, containing about sixty different articles, is prepared with special reference to the needs of patients suffering from dilated stomachs. Diet-list H is for diabetics.

The requirements of other morbid conditions frequently encountered are similarly met by appropriate lists. By this means the patient is given opportunity to select from a large variety of foods which are adapted to his condition, without being obliged to study and ponder the question whether this or that is likely to agree with him. This habit of introspection, or inquisitive peering almost incessantly into one's stomach, or indeed, keeping under minute observation any part of the internal anatomy, is a most pernicious practice, the common prevalence of which among dyspeptics, is one of the greatest obstacles met with in the treatment of this disease. When the patient sits down at the diet-table, bearing in

mind the numbers or letters which he finds upon his diet prescription, he has only to select from those dishes which bear the same numbers or letters, such as he finds suited to his taste, without giving a moment's thought to the compatibility or incompatibility of the dishes with one another, or with his digestive apparatus.

The number of meals which the patient takes is determined by the amount and quantity of food prescribed for him, and the ability of his stomach to digest. It is sometimes as necessary and appropriate to order four or even six meals per diem in a given case as to prescribe one meal a day, or even no food at all by the mouth or stomach for a day or two or a few weeks, rectal alimentation being resorted to.

In connection with the dietetic treatment of a patient, a close watch is kept of the urine. The amount of urea, and especially of total solids, is carefully determined by frequent analyses, and in some cases the toxic value of the excretions is also carefully studied by the admirable methods developed by Bouchard, the eminent French pathologist.

By the plan above outlined, the problem of supplying the dietetic needs of several hundred invalids is dealt with in a manner which must be considered satisfactory, if the results are a proper criterion for determining its value. Those who have been accustomed to take their meals at the most fashionable hotels are often loudest in their praise of the elegant *cuisine* and delicately prepared dishes which the Sanitarium bill of fare provides in such profusion and variety. The tempting bill of fare placed before the new-comer at the Sanitarium is often a surprise to him, as he had perhaps pictured to himself, instead of the delicately prepared and daintily served *menu*, a bill of fare savoring largely of the old-fashioned sick-room diet, or in some way tainted with hospital smells or medicinal formulæ. The universal commendation which this department of the Institution elicits from patrons may be justly considered a triumph of the effort which has been made in the direction of the development of medical dietetics through the patient and almost continuous researches and experimentation which has been carried on by Mrs. Kellogg during the last ten years, in the experimental kitchen connected with the Institution.

(To be Continued.)

ANTISEPTIC.
PROPHYLACTIC.
DEODORANT.

LISTERINE

NON-TOXIC.
NON-IRRITANT.
NON-ESCHAROTIC.

FORMULA.—Listerine is the essential antiseptic constituent of Thyme, Eucalyptus Baptisia, Gaultheria, and Mentha, Arvensis, in combination. Each fluid drachm also contains two grains of refined and purified Benzo-boracic Acid.

DOSE.—INTERNALLY: One teaspoonful three or more times a day (as indicated), either full strength or diluted, as necessary for varied conditions.

LISTERINE is a well-proven antiseptic agent—an antizymotic—especially useful in the management of catarrhal conditions of the mucous membrane; adapted to internal use, and to make and maintain surgical cleanliness—asepsis—in the treatment of all parts of the human body, whether by spray, irrigation, atomization, or simple local application, and therefore characterized by its particular adaptability to the field of

PREVENTIVE MEDICINE—INDIVIDUAL PROPHYLAXIS.

LISTERINE

Destroys promptly all odors emanating from diseased gums and teeth, and will be found of great value when taken internally, in teaspoonful doses, to control the fermentative eructations of dyspepsia, and to disinfect the mouth, throat, and stomach. It is a perfect tooth and mouth wash, *indispensable for the dental toilet.*

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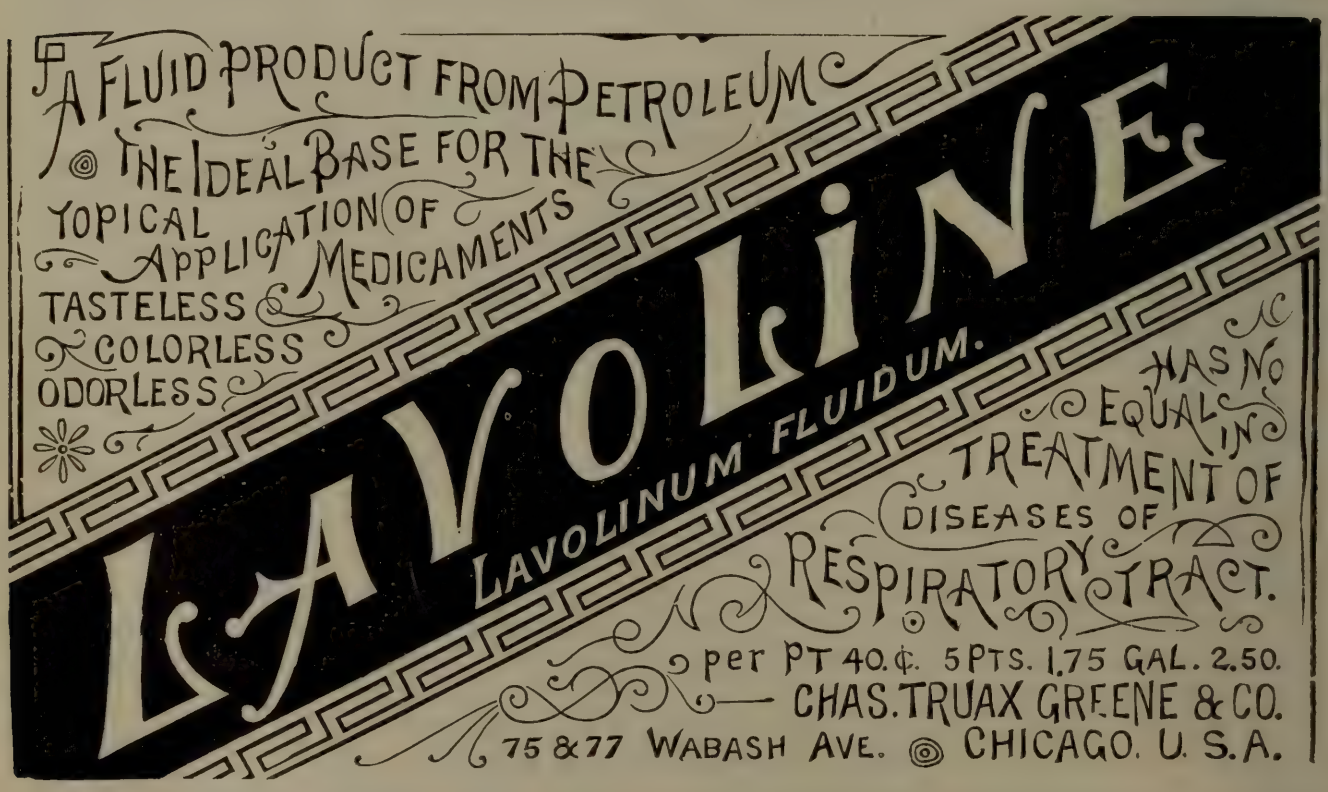
PUBLISHERS' DEPARTMENT.

THE TEXAS SANITARIAN is a new and most worthy and interesting journal of preventive medicine and hygiene, under the management of Dr. T. B. Bennett, Austin, Tex. The two first numbers at once place this practical magazine among the foremost scientific journals of the country. We trust it will be fully appreciated.

LIPPINCOTT'S MAGAZINE FOR FEBRUARY, 1892. —Frontispiece (portrait of Mrs. M. E. W. Sherwood); "Roy the Royalist," by William Westall; "The Managing Editor" (the Journalist Series), by Julius Chambers; "February," by Louise Chandler Moulton; "The Hackney-Horse" (interview with Dr. R. S. Huidekoper), by Louis N. Megargee; "Across the Sea," by Philip Bourke Marston; "Secretary Rusk's Crusade," by Julian Hawthorne; "Sonnet," by Elizabeth Carpenter; "The Board of Trade and the Farmer," by Henry Clews; "The Ambassador," by Charles Converse Tyler; "Jermyn's Portrait," by Clara Lanza; "Days of my Youth," by St. George Tucker; "Swimming" (Athletic Series), by Hermann Oelrichs; "Prince Gallitzin, Priest and Pioneer," by Hester Dorsey Richardson; "Since the Beginning," by Kate Putnam Osgood; "Recollections," by Mrs. M. E. W. Sherwood; "Intangible," by Kate B. Lathrop; "The English Sparrow," by Mary Isabella Forsyth; "Names vs. Initials," by Jane de Forest Shelton; "As it seems;" "With the Wits" (illustrated by leading artists).

THE MEDICAL FORTNIGHTLY.—A journal of Medicine, Surgery, Microscopy, and Pharmacy, edited by Dr. Brausford Lewis, St. Louis, Mo. Few magazines have made their appearance with more promise in medical journalism. Dr. Lewis is an experienced editor, and the first number of his new publication is full of solid matter and good thoughts for the doctors. We bespeak complete success in his enterprise and congratulate the proprietor.

THE LABORATORY OF HYGIENE (Sanitarium), J. H. Kellogg, M.D., Sup't; Paul Paquin, M.D., D. V. S., Director. *Vaccine Department.*—The vaccine produced here (from a purely scientific and humane standpoint, and not for profit) is the purest to be obtained in the country. It is propagated in a new building fitted especially for the production of vaccinia as free from any and all impurities as is possible. No vaccine is sent out before it is tested as to its safety and activity, both by microscopical and bacteriological analysis. Physicians and the public may rely on the absolute safety of our products. No other institution is operated on the same aseptic and scientific principles. We guarantee safety in regard to the virulent germs and filth which render so many of the commercial products useless or dangerous. 10 points, $1.00. BACTERIOLOGICAL WORLD AND MODERN MEDICINE, with ten points, $2.00. Address, Good Health, or Modern Medicine Pub. Co., Battle Creek, Mich.



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MORPHOLOGY OF THE YEAST-PLANT.

(See page 125.)

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., FEBRUARY, 1892. NO. 4.

ORIGINAL ARTICLES.

OBSERVATIONS ON STAINING THE FLAGELLA ON MOTILE BACTERIA.[1]

BY VERANUS A. MOORE, M. D.,
Washington, D. C.

FROM a microscopical standpoint no branch of the investigation of micro-organisms is, perhaps, more interesting than the study of the flagella on motile bacteria. As their discovery has shown the structure of these organisms to be much more complex than was before supposed, the determination of the number and arrangement of these minute appendages with which the various species are provided, is important, not only from the knowledge thus derived of their structure, but also as a possible aid in the differentiation of closely allied species.

The fact that certain motile bacteria were provided with flagella was made known early in the history of bacteriology, but there seems to have been no method devised, until a comparatively recent time, by which they could be carefully studied, or by which their presence on other motile forms could be shown. The difficulty in detecting the flagella on bacteria in a fresh condition is well illustrated by the investigations of Dallinger and Drysdale, who saw only a few of these appendages in a preparation of *bacterium termo* after an incessant examination of nearly five hours. Although our instruments and methods have been much improved since that time, I believe that at the present time the satisfactory demonstration of flagella on living bacteria is one of the most difficult tasks known to microscopists.

It is through the development of the staining processes that the demonstration of these appendages on the great majority of motile bacteria has been made possible and, in many cases, comparatively simple. As early as 1877, Koch succeeded in staining the flagella on a certain number of the larger saprophytic bacteria. Since then other methods have been devised, which are applicable to the smaller and also the pathogenic forms. By the aid of these methods the flagella have become recognized as forming a part in the morphology of motile bacteria. This fact is important, as any difference found to be constant between the character of the flagella of two bacilli, will be as significant in differentiating them, the one from the other, as the presence or absence of spores or a difference in the form or size of the bodies of the germs themselves. It is for their differential value that a knowledge of the flagella may render valuable service to the practical bacteriologist.

In 1889, Loeffler published a method in which he introduced the principle of a mordant in staining the flagella and cilia on micro-organisms. By subjecting the preparations to the action of a mordant before they were brought into the staining fluid, he succeeded in staining a considerable number of bacteria. There were, however, many motile forms on which these appendages could not be detected. This fact led to further investigation, which resulted in the discovery of the principle "*that the alkali-producing organisms required an acid mordant, and the acid-producing organisms required an alkaline mordant.*" This was based upon the result obtained by Petruschky[1] who had found that a large number of bacteria would convert the action of a neutral medium (liquid) into either an acid or an alkaline during their multiplication.

The importance of Loeffler's method in the acquisition of our knowledge of the flagella of bacteria has prompted me to present it here, in a form as condensed as possible, both for its own value and as a basis for my subsequent remarks. The

1 Read before the American Society of Microscopists, August, 1891.

1 Centralblatt f. Bakteriology u. Parasitenkunde, Bd. V. (1889), p. 625.

formulæ for the preparation of the mordant and staining fluid, together with the details in their application, are as follows: —

The *mordant*, to 10 c. c. of a 20 per cent aqueous solution of tannin, 5 c. c. of a cold saturated solution of the sulphate of iron, and 1 c. c. of an aqueous or alcoholic solution of fuchsin, methyl-violet, or "Wollschwarzlösung," are added.

The foregoing solution is to be regarded as the standard or stock solution to be used, and one which is successfully employed in staining the flagella of certain microbes; but for others the addition of an acid or alkali is necessary. Thus for the *comma bacillus* it is necessary to add to the 16 c. c. of mordant ½ to 1 drop of a solution of sulphuric acid, equivalent to a 1 per cent solution of sodium hydrate. For the *typhoid bacillus* 1 c. c. of a 1 per cent solution of sodium hydrate must be added to the 16 c. c. of mordant. By first determining whether the germ in question is an alkali or acid producing organism, the necessary quantity of the acid or alkaline solution to be added to the mordant can easily be determined by actual experiment.

The staining fluid consists of a saturated solution of crystal fuchsin in the ordinary aniline water. As the aniline water is very nearly neutral, a saturated solution of fuchsin in it is sufficient. Better results may possibly be obtained by adding to this as much of a 1–1000 solution of sodium hydrate as is necessary to bring it almost to a point of precipitation.

Cover-glass preparations should be made of the bacteria to be studied in such a manner as to avoid all albuminous material. This is best accomplished by transferring a very small quantity of the growth from an agar or gelatine culture to a drop of sterile water on a cover-glass, and thoroughly mixing; a small quantity of this is conveyed to a second cover-glass and treated in a like manner; and again, from the second a third preparation is made. By this treatment the albuminous substance is sufficiently diluted, and the bacteria are isolated in an aqueous medium. The preparation is allowed to dry in the air. Sterilized hydrant water is preferred to distilled water for diluting the culture. It is of the utmost importance that the cover-glass should be free from all impurities. The film on the cover-glass is fixed by heat, but care must be taken not to overheat the preparation. The desired temperature can be obtained by holding the cover between the thumb and index-finger, over the flame, instead of passing it through the flame by means of forceps.

By this method overheating is avoided. After heating, the film on the cover-glass is covered with the mordant, and held over a flame until steam is given off. It is then removed, and after ½ to 1 minute the cover is rinsed in water, then in absolute alcohol, and again in water until the mordant is completely removed. Care must be taken to remove all traces of the mordant from the cover-glass, as it would form, if present, a very troublesome precipitate with the staining fluid. The film is then covered with a few drops of the staining solution, and the preparation again heated until the solution begins to vaporize. It is then removed from the flame, and after allowing the stain to act for about 1 minute, the cover is washed in a stream of water. The preparation can be examined immediately in water, or allowed to dry and be mounted in balsam. The bacteria with their flagella should be deeply stained, resting upon a colorless background if they are distributed in a purely aqueous substance, but if albumen is present, they are surrounded by a uniformly feebly stained medium, the intensity of which depends upon the quantity of albumen present.

By the use of this method the flagella have been stained on not only a large number of saprophytic, but also on all of the known motile, pathogenic bacteria. Unfortunately the results usually obtained by this process are not satisfactory for the differential purposes suggested in a previous paragraph. The difficulty is not in simply demonstrating their presence, but in the inability to determine the number and arrangement of these appendages on the individual bacteria. In all of the preparations that I have examined, that had been stained by this method, there were a large number of bacilli which exhibited no flagella, while on the others the number was variable; but lying between the bacilli were a greater or less number of flagella that had become detached from the bodies of the germs, presumably during the process of preparation. This is especially prominent in preparations of bacteria that are provided with a considerable number of these appendages, such, for example, as the hog cholera and typhoid bacilli. This fact renders it difficult, if not impossible, to determine the number of flagella with which the individual bacteria of a given species are provided.

Notwithstanding this difficulty which I have met, the method has given such satisfactory results in the hands of A. Messea, an Italian investigator, that he has proposed a systematic classification of bacteria based upon the number and arrangement of the flagella. This classification is as follows: —

1. Gymnobacteria.
2. Trichobacteria, { 1. *Monotricha.* 2. *Lophotricha.* 3. *Amphitricha.* 4. *Peritricha.*

The *Monotricha* have one flagellum at one pole of the bacillus (*Bacillus pyocyamus*). The *Lophotricha* have a tuft, or bunch, of flagella at one pole of the bacillus (*Bacillus of blue milk*). The *Amphitricha* have a flagellum at each pole (*Spirillum volutans*). The *Peritricha* are provided with rows of flagella (*Bacillus typhosus*).

Kruse[1] in a review of Messea's article says that this classification can have only a secondary value. It is evident that it would conflict very seriously with the natural grouping of the *Schizomycetes*, as for example, the *Monotricha* would include bacilli spirilla and at least one micrococcus (the motile micrococcus described by Ali Cohen).

In order to find some process by which I could determine more definitely the minute details respecting the number, size, and arrangement of the flagella, especially on the hog-cholera and typhoid bacilli, I have made a considerable number of tests with Loeffler's and other methods,[2] and with various modifications in both the preparation of the solutions used and in the technique of their application. The result of this experimental work has been very largely negative, but the careful testing of each step in the various processes, especially that of Loeffler, has been productive in revealing a few facts which are deemed worthy of notice. Some of these have suggested certain slight modifications in the technique of Loeffler's process which promise to be of considerable value in the further study of these structures. As his method has already been quoted, I shall refer only to those sections of it for which modifications are suggested, or which, for other reasons, are deemed worthy of special remark. These are as follows: —

1. *The Distribution of the Bacteria on the Cover-Glass.*— It is of the utmost importance that the bacteria be properly isolated in the preparation. This can be accomplished very satisfactorily by the following process: The cover-glasses, after being *thoroughly* cleaned, are spread on a level tray. On each cover-glass is placed, by means of a flamed pipette, a moderately large drop of sterile water (distilled or hydrant). This will spread over the entire surface of the cover, if it has been properly cleaned. The end of a flamed platinum wire is very gently touched to the surface growth of an agar or gelatine culture of the germ in question, after which it is very carefully immersed two or three times in as many places in the water on each cover-glass. A sufficiently large number of bacteria will adhere to the end of the wire to make from four to ten preparations. The cover-glasses are then placed in an incubator at a temperature of about 36° C., where they are allowed to remain until the water is evaporated.

Many of the bacteria by means of their power of locomotion will become separated from the clump of germs introduced by the wire, and will be found, on the drying of the preparation, to be distributed very satisfactorily around these centers. This natural separation of the bacteria prevents the breaking off of the flagella by staining or other artificial means employed in securing the necessary distribution and isolation. In this manner I have isolated the bacteria in a preparation, so that in many fields not more than a score of germs could be seen, and the excellent condition of their flagella warrant my recommending this method of preparation. The fact that the bacteria are properly isolated over only a small portion of the preparation is not necessarily an objection. Our hopes, however, are not yet fully realized, for there will generally be a few, often many, detached flagella lying between the bacteria, some of which are partially or wholly deprived of their appendages. I have frequently observed clumps of flagella which gave the appearance of those belonging to an individual germ, the body of which had disappeared. As these were found in preparations made from old cultures, they suggest the possibility that the body of the germ is first to degenerate, or else that through some physiological process the flagella are detached from the bodies of

[1] Centralblatt f. Bakteriologie u. Parasitenkunde Bd. IX (1891) r. 107.

[2] Trenkmann's are the only methods, other than Loeffler's, that I have found to be of any special value. They involve, however, practically the same principles as those given by Loeffler, and consequently need not be discussed here. For reference and titles of the various articles on the demonstration of the flagella on motile bacteria, see bibliography.

the bacteria after a certain age is attained. These hypotheses are strengthened somewhat by the fact that in preparations from older cultures there appears to be a greater number of detached flagella.

2. *The Composition of the Mordant.* — The mordant recommended by Loeffler seems to be the most satisfactory of any thus far suggested for general use. I I have found, however, that a mordant which contains only 10 per cent tannic acid can occasionally be used with advantage. It can be more easily and thoroughly removed from the specimen, and consequently the formation of a troublesome precipitate with the staining fluid occurs less frequently. It was found that with the *hog-cholera bacillus* it gave equally as good results as the one containing 20 per cent tannin; with the *typhoid bacillus* it was not so satisfactory, and with a *water bacillus* a 20 per cent tannin solution in the mordant was necessary to secure the staining of the flagella. From a limited number of experiments, it seems quite probable that a variation in the quantity of the tannic acid in the mordant may be of much service in staining the flagella on certain bacteria where difficulties are experienced with the use of the mordant prepared after Loeffler's formula. Although I have tried a considerable number of the "fixing agents," I have thus far been unable to stain flagella with the use of any mordant not containing tannic acid.

In applying the mordant, I have met with better results by allowing it to act for from three to four minutes. A convenient method of heating the mordant on the cover-glass is to pass it several times through the lower portion of the flame, which heats it sufficiently and prevents spattering. A safer method is to heat the preparation for the required time in a watch-glass containing the mordant.

The heating of the cover-glass to fix the film is also an important condition in the success of the operation. Loeffler's method has the objection that it is difficult to heat the preparations uniformly. I have employed a hot-air chamber for this purpose, and after a series of experiments ranging in temperature from 90° to 180° C. and in duration from one fourth to five minutes, I have found that I could obtain the best results by heating the preparation for one minute at a temperature of about 120° C. Little, if any, difference was noticed in preparations heated at a temperature varying from 120°–140° C.

3. *The Reaction of the Mordant.* — Experiments have shown that the statement made by Loeffler, that an alkali-producing organism required an acid mordant, and an acid-producing organism an alkaline mordant, need not be taken in a very strict sense. This is illustrated with the hog-cholera bacillus. As it is an alkali-producing germ it would be necessary, according to Loeffler's statement, to add a certain quantity of the acid solution to the mordant in order to stain its flagella. Dr. Theobald Smith stained the flagella on this bacillus by the use of the neutral or standard mordant.[1] Further investigation has shown that the flagella can be stained by the use of the mordant containing a variable quantity of either the acid or sodium solution, good results being obtained when as much as 3 c. c. of either solution was added to the 16 c. c. of the mordant. It is better to add the sodium solution just before the mordant is to be used. I have also found that the flagella on the typhoid bacillus, an acid-producing germ, can be stained by the use of either the acid or alkaline mordant. This deviation from Loeffler's results with the typhoid bacillus may possibly be due to the age of the germ, as the one I used had been preserved by means of subcultures, for several years. The same range in the reaction of the mordant was found to be applicable to a few other bacteria.

4. *The Staining Fluid.* — I have found that carbol fuchsin (10 c. c. of a saturated alcoholic solution of fuchsin, 100 c. c. of a 5 per cent solution of carbolic acid) gives equally as good, if not better results, than the aniline water fuchsin recommended by Loeffler. It also has the advantage that it can be kept for a much longer time, and consequently is ready for use at any moment. It has a less tendency to form a precipitate with any trace of the mordant that might be left on the cover. I have also stained the flagella very nicely with Loeffler's alkaline methylene blue.

5. *The Age of the Culture to be Used.* — A careful examination of the growth from cultures of certain bacteria shows that the flagella can be stained on these germs from cultures varying in age from 20 hours to several weeks. For simply demonstrating their presence any aged cult-

[1] Dr. Smith pointed out that the reaction of the culture liquid with some bacteria may be either acid or alkaline, according as glucose or other sugars are present or absent. These undergo fermentation with the formation of acids. In liquids free from sugars the reaction becomes speedily alkaline. Petruschky's classification of bacteria as acid or alkali producing is thus shown to depend largely on the composition of the culture medium.

ure, within the limits mentioned, can be used. In old cultures the flagella are more broken, and a larger number of detached appendages are observed. I have obtained my best results with a culture that had grown for about 48 hours. The surface of agar seems preferable to gelatine for cultivating bacteria for this purpose.

In testing the various methods and their modifications, I have stained the flagella on a considerable number of bacteria, among which I will mention a large motile bacillus quite common in Potomac water, the *bacillus fluorescens liquefaciens*, and the *bacillus coli communis*. The latter one, like the typhoid bacillus, is provided with rings of flagella, and consequently belongs to the *peritricha*. The flagella on each of these species have been stained by the use of both an alkaline and an acid mordant.

Although a large amount of work has been done to develop satisfactory methods for staining the flagella on motile bacteria, there seem to be many conditions that are not yet fully understood. These must be carefully worked out by actual experiment before we will be able to determine accurately the specific character of the flagella on the different species of bacteria.

No flagella have been found on the swine-plague and other non-motile bacteria, although a very large number of specimens have been stained by the same methods that I have successfully employed with the motile forms. This, together with the fact that with certain motile bacteria, at least a few flagella can be seen in every stained preparation, eliminates from the writer's mind the doubt that has occasionally been expressed, that the long, wavy or spiral filaments seem to radiate from the bacteria, or, lying between them, do not belong to the germs with which they are associated.

I am indebted to Dr. Theobald Smith for suggestions which he has offered from time to time during the prosecution of this work.

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INFLUENCE OF THE CONTINUOUS CURRENT ON MICROBES, PARTICULARLY ON CHARBON BACTERIDIA.

BY M. M. APOSTOLI AND LAGUERRIERE, OF PARIS.

(Concluded.)

Fifty-first Series (July 2, 1890), Streptococcus Pyogenes Aureus. Apparatus No. 3.

THE experiments made gave no result, the cultures having attenuated themselves before the operation.

Fifty-second Series (July 10, 1890), Charbon. Apparatus No. 3.

1. Apparatus No. 3, placed in ice, received a culture of anthrax broth. Positive thermometer, 6½°; negative, 5½°. This temperature is owing to the fact that we did not wait sufficiently long for the refrigeration to take place.

The positive electrode, in aluminum, was rolled around a piece of lead.

2. The inoculation made before the passage of the current killed the inoculated guinea-pigs.

3. A current of 200 milliamperes of 2 minutes' duration, did not in the least modify the virulence of the positive pole. Guinea-pigs were killed by inoculation; sowings created virulent cultures.

4. A current of 200 milliamperes of 5 minutes' duration gave the same results.

N. B. The oxygen being absorbed at the positive pole, rendered that pole indifferent.

Résumé and General Conclusions.

The preceding experimental researches, which extended from October 23, 1888, to July 10, 1890, complete the reading that we presented to the Academy of Sciences, April 28, 1890.

These researches can be subdivided into three successive stages, denoting a pro-

gressive advancement in the development of the scientific principles that we have undertaken to eliminate.

First Stage.—*The study of the action of the constant galvanic current, the poles being placed at a short distance from each other in a homogeneous media, and in a single testing-tube.* Simultaneous utilization of the thermal action and of the electrolytic action: Here the negative chemical polar action attenuated the near inverse polar positive action by the recombination of acids with the bases, and the final action was in a large measure reduced to a simple thermal, a witness and effect of the electrolytic and chemical labor, first that of analysis and then that of synthesis.

In fine, what attenuated or killed the media of culture in this first series of experiments, was especially the considerable elevation of the temperature which, in the operatory conditions in which we were placed, had been able to reach nearly 100° C., without making it necessary to invoke an additional electrical action.

In these conditions, and very naturally, extractions made in any media of culture on which experiments are made, have been found to be influenced uniformly and equally (in a variable way according to the dose employed, of course), without our being able to discern any difference between the topographical and polar actions.

The following conclusions deduced from this first series of researches were consigned to the Academy of Sciences August 12, 1889, in a note folded and sealed: —

"1. *The action of the constant galvanic current is en rapport direct with the intensity of the current estimated in milliamperes.*

"2. *All things being equal, to secure one and the same intensity, it is not essential to attach very much importance to the duration of the application, the intensity of the current being always the principal factor of the effects obtained, provided, however, that the application is at the minimum of a duration of from five to ten minutes.*

"3. *A current of 500 milliamperes or more, applied for five minutes, kills constantly bacteridia of charbon. The sowings done with the culture thus treated remain sterile, and the inoculation on the guinea-pig is ineffective.*

"4. *A current of from 200 to 250 milliamperes, applied for five minutes, does not surely and constantly destroy the virulence; a few guinea-pigs die, but more slowly than the witnesses inoculated comparatively with the same culture that has not been subjected to the current.*

"5. *A current of 100 milliamperes and more, even after an application of thirty minutes, does not destroy the virulence; an attenuation is produced which increases with the intensity of the current, and which accuses itself by the fact that the inoculated guinea-pigs die one or two days later than the witnesses.*"

Second Stage.— In the same preceding instrumental conditions (with the same testing-tube and the same media of culture), we have suppressed the thermal influence to appreciate the pure and simple electrolytic action.

Here the conclusions were somewhat similar to those of the first series, which we have just expressed. There was, however, this difference: a much more intense current was necessary to attenuate or kill the virulence. This was owing to the fact that, to a certain extent, the very near polar actions (in the conditions in which we are placed) attenuate themselves reciprocally by the secondary synthesis which is formed by the union of the acids with the bases.

Third Stage.— *Study of the two purely isolated polar actions and of the intermediary or interpolary action.*

Here we could equally utilize at pleasure the chemical or electrolytic action and the thermal action as related to each other —or we could eliminate experimentally the latter action (the thermal action) to study only the polar and intermediary action disconnected from all calorific influence.

It is especially to this last series of researches in the laboratory, that we have given our attention; and we hope soon to be able to complete them in utilizing, at one stroke, the thermal and chemical action, as is done normally in the applications of electrotherapy to man.

The following are the general and definite conclusions of this third series of experiments, which determine the study of the simple electrolytic action: —

1. *In a homogenic media, a galvanic current, constant and without proper action,* or suis generis, *on microbian cultures.*

2. The only action clearly discernible appears at the positive pole.

3. *There is* (in the experimental conditions in which we are placed) *no sensible action at the negative pole or in the chain of the interpolary circuit.*

4. *This action is purely chemical, or electrolytic, and is due particularly to the oxy-*

gen that is generated, liberated, and accumulated at the positive pole; indeed if this oxygen is absorbed at the moment of its dégagement or liberation, there is restored to that pole, become active and microbian, all, or a part of its action, natural or indifferent, for the microbes, as in the other points of the circuit.

5. *This action of attenuation on microbes is controlled, in part, by the laws of electrolysis, and is proportionate to the intensity of the current and to the duration of its application.*

Howbeit, there are grounds for the following reserve: A current of 50 milliamperes applied 30 minutes does not produce the same effect that one of 200 milliamperes does in 5 minutes,—the first does not kill microbes, the second does, which shows that in order that the microbian action may act efficaciously, it must first have quite a high intensity, and that the duration of the application is a secondary factor, which intervenes in an especial manner only when the required intensity is obtained.

6. *The microbian action or antiseptic of the positive pole, in a media of distinct culture, and entirely separated from the negative pole, exercises itself in more feeble doses than in our first series of researches, where the two poles, being contiguous, attenuate their reciprocal chemical action.*

Hence, here the positive pole does not kill at 50 milliamperes during an application that can vary frou 5 to 30 minutes; but beyond 50 milliamperes, the attenuation commences and increases progressively to become constant after 5 minutes, between 100 and 150 milliamperes.

7. A feeble current, below 50 milliamperes, can bring back the virulence in a media of culture where it had been previously attenuated, and can exert a revivifying action on microbes, due to the presence of oxygen in a small quantity. Thus, the guinea-pigs inoculated before this experiment, do not die, while those who are inoculated after it, succumb.

Diet in Gastric Neurasthenia, or Nervous Dyspepsia.—Dr. Bilfinger, an eminent German physician, recommends (*Allg. medecin. Centralztg.*) that the diet of a person suffering from this disease should be as bland as possible, and suggests a modified vegetable diet, consisting chiefly of milk and oatmeal porridge, or other farinaceous foods. Peas and beans are also recommended; acorn coffee should be used in place of the coffee bean.

THE APPLICATION OF THE MICROSCOPE IN MEDICAL, MEDICO-LEGAL, AND LEGAL DIFFICULTIES.

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(Concluded.)

LEGAL MICROSCOPY.

LEGAL microscopy is certainly a unique and extremely interesting study, not only to the attorney but the physician as well. The development of this subject is due principally to Geo. E. Fell, M. D., who has bestowed upon it the most scientific and accurate study.

Microscopy in its application to legal questions is a novelty, and the most surprising results are anticipated from the application of the microscope in the examination of legal documents, currency, and all printed and written matter, including forgeries, mutilated wills, and other documents.

More than once has the microscopical examination lighted the path of the attorney, detected the work of the forger and mutilator, and shielded the innocent or convicted the guilty.

The microscopical examinations of legal documents of all kinds presents a wide range of observation. We may first begin with the characteristics of the paper of the document, which may enable us to ascertain many important facts; for instance, a great similarity might indicate, with associated facts, that the documents were prepared about the same time, or by the same person; a marked dissimilarity might be an equally important matter. Secondly, the differences in paper may exist in the character of the fibers composing it, the finish of the surface, the thickness, modifying the transmissibility of light, the color, etc. All these points may be accurately compared and differentiated by use of the microscope. Thirdly, the ink is to be considered and examined. In case an addition has been made to a document within a reasonable length of time, the different inks may be distinguished from each other. The following differences between the inks may be apparent:—

Some inks in drying assume a dull, others a slimy surface. If in sufficient quantity the surface may become cracked, presenting, when magnified, the appearance of dried clay. It is well to note whether the ink forms an even, somewhat

regular border, or spreads out to some extent. Fourthly, the color of the different inks studied by transmitted or reflected illumination, is of the greatest importance.

This difference of inks, in one case investigated by Dr. Geo. E. Fell, at least proved the addition of certain words which completely annulled the value of a document involving several thousand dollars. In another case where words were written over the original writing so as to cover completely, the difference of inks could still be detected by a microscopical examination. Fifthly, erasures and additions are the principal points of consideration in the microscopical examination of documents. There are two distinct modes of making an erasure; first, by a sharp instrument, and secondly, by a chemical preparation. The former is more commonly employed, and is usually accomplished by scraping the paper with a sharp knife until the writing is invisible to the naked eye. Under the microscope every stroke of the pen is visible, and even the color of the different ink may be revealed.

The more skillful mutilator employs a chemical preparation. The ink becomes soluble under the action of the chemicals used, and then is easily removed by means of a blotter or absorbent cotton. This also is an imperfect method, the letters may be readily traced under the microscope. Usually the chemical leaves a stain, and the fibers of the paper are more or less injured by its action, thus leaving evidence that the erasure has been made.

Geo. E. Fell says the eye of the individual making the erasure is certainly not sufficient, and even with the aid of a hand magnifier the object may not be effectually accomplished. The detection of an erasure made by a knife is a very simple matter, and may be accomplished by a novice. An investigation may be made by simply holding the document before a strong light, and this is usually all that is necessary to demonstrate an erasure of any consequence. This is, however, a very different matter from tracing the outlines of a word or detecting the general arrangement of the fibers of the paper, so as to be enabled to state whether writing has been executed on certain parts of the document.

On several occasions I have been able to detect additions made to certain documents, two of which were wills. The additions were made in the following manner: —

First, there was an erasure, then words were written over the erasure. With the microscope I could detect both erasure and addition; also the different colors of inks used, and next, the most important characteristics, namely, the strokes of the pen, and finally, the general execution.

A microscopical examination of legal documents, such as U. S. currency, wills, and all other printed or written matter, must consist always of the above-mentioned observations. The general mode of execution includes the comparative expression of the original writing and that of the additional. Especial attention must be given to the shading, the formation of letters both in the downward and upward strokes, capitals and small letters, punctuation marks, etc. All these points must be taken into consideration in making a microscopical analysis.

In the examination of commercial papers and documents, such as contracts, agreements, wills, notes, checks, etc., to detect a mutilation or forgery, the application of the microscope is certainly the most accurate and reliable, as well as the easiest and simplest method. It is certainly the best method of establishing the genuineness of an autograph.

And finally, we will discuss one of the most important branches of legal microscopy, and that is the detection of counterfeit currency, both American and foreign. The detection of counterfeit U. S. currency has long puzzled merchants, bankers, and even expert cashiers. But now the most skillful counterfeiter can no longer defy detection. The expert microscopist cannot be deceived. The same rules must be observed in the microscopical examination of currency as in the examination of written and printed documents, but a certain additional observation is necessary; examine, first, the quality of the paper used; secondly, the execution and finish of the bill; thirdly, the grade and color of the inks; fourthly, the printed condition of the bill including the autograph; fifthly, the most important characteristic by which a genuine bill is distinguished from a counterfeit, viz., the red line running lengthwise across the bill.

This line in a genuine bill is a red silk thread woven into the paper, while in a counterfeit it is simply a line drawn with red ink.

MEDICAL common sense is of more value than a drug-store of medicine.

LESSONS IN BACTERIOLOGY.

BY PAUL PAQUIN, M. D., D. V. S.

Lesson IX. — Experiments on Animals.

Part II.—Inoculation.

In this part of our lesson we shall deal with inoculation of animals. The mode of inoculating an animal, and the spot chosen, depend on the object in view; for instance, if it is desired to produce infection merely, it is immaterial where and how the inoculation takes place, provided it does take place through the medium of the virus to be tested, without extensive local injury. But if it is desired to produce symptoms similar to a given disease, and as much as possible under the circumstances usually attendant on the occurrence thereof, then it may become necessary to use such processes as will be deemed advisable for the purpose. It may be necessary, for instance, to produce disease by inhalation of the germs, or by inoculation in certain portions of the nervous system, for instance the dura mater, or by inoculation within a bloodvessel, or by the introduction of cultures under the skin. It will be observed, therefore, that the processes of inoculation to be pursued, depend on the object intended, taking into account the nature and properties of the micro-organisms.

In most of these operations, inoculation is comparatively painless, for usually it is done hypodermically. There is no necessity, in such instances, to use any anæsthetics. In other instances, it is necessary, both to save pain and to make matters easy, to use anæsthesia. This is demanded in cases of trephining, for instance for inoculation with rabies. For that purpose rats or mice may be placed under a glass with a wad of cotton or a sponge moistened with ether or chloroform; ether is preferable. They will soon succumb, and they can then be handled easily. These animals are very susceptible to ether, and can be kept under its influence very easily, after they are tied. With guinea-pigs and rabbits it is more difficult, as both are very liable to die of asphyxia, and it takes a great deal of practice to become accustomed to the degree of anæsthesia which these animals will stand.

In small animals like mice, a mere infection may be produced by scarifying the ear and rubbing in the virus. Subcutaneous injections can be practiced anywhere in them, but it is better in the back. If one desires to produce infection by scarification on the body, it is necessary first to cut the hair close and clean the spot well. In larger animals, like the cat, the guinea-pig, and the rabbit, subcutaneous injections may be made in the thighs, side, back, and almost any place where the skin is comparatively loose.

The instruments used to inoculate, are, the hypodermic syringe, if a liquid; forceps, if a solid body; or a lancet-needle or scalpel, if the material is to be rubbed into scarifications. A syringe is used every time that a considerable amount of virus liquid is to be inoculated. A pair of sterilized forceps serve to introduce beneath the skin a solid infectious body.

The material for inoculation is usually from pure cultures; if these are liquid, a sufficient quantity is drawn with a sterile pipette, dropped into a clean watch-glass, and the syringe is filled. If the culture is in a solid medium following the line of the inoculating needle, it is difficult to get sufficient material without cutting into the mass, or adding a little sterilized distilled water to wash the culture out of its cavity, when it can be drawn with a pipette or emptied directly into a watch-glass. If it becomes necessary to cut into the medium, the process of extracting it from the test-tube varies according to whether it is a solid, gelatine or agar-agar, or again, blood serum. In case of gelatine, the tube is dipped in hot water until the edges on the surface in contact with the glass, melt, and then the contents are emptied into a watch-glass. If it is an agar-agar, heat will not dissolve it enough to get the same effect. In this case the tube is warmed a little, the pipette is thrust to the bottom of it, and by blowing a strong puff through it, the culture will be made to loosen, and if handled properly, to leap out of the tube and fall into the watch-glass. This requires a little skill. If it is serum, it is necessary to take a long-handled, narrow-bladed knife, sterilized, and cut the moss in the tube; no amount of heat, or any other process, will safely loosen it from the glass.

If it is desired to inoculate into the circulation, larger animals than the mouse or rat should be used; the rabbit is preferable. In these, intro-venous injections should take place in the ear and leg. For inoculation in a vein of the ear, take a long towel and wrap the rabbit firmly, so that only the head will project, and, in

the language of Salmonsen, "wash the ear with 2 per cent of carbolic acid solution, partly to disinfect it, and partly to make the vessel more apparent; let the assistant hold the animal's head and compress the base of the ear so that the veins will swell, seize the ear between the thumb and forefinger by the left hand, so that it is slightly tense over the side of the forefinger, thrust the canula carefully through the skin; now let the assistant release the end of the vein and then inject slowly with the forefinger and thumb." When the vein has not been pierced, the fluid swells the skin in the neighborhood of the puncture; then it is about useless to try to enter the vein from that point; another vein ought to be chosen or another point of the same one. The vein running along the edge of the ear posteriorly is a good one for injection. Some operators prefer to make an incision through the skin at the side of the vein, then bring the vein and the incision in juxtaposition. It is then easy to introduce the hypodermic needle by having to pierce only the walls of the vein instead of having to pierce, besides, the skin covering it.

For injection into a vein of the leg, wrapping of the animal should take place in the same manner, leaving only one hind leg loose. The rabbit is then held by an assistant in a proper manner — preferably by holding the rabbit in his lap. One of the veins in the lower extremity of the leg is found, the hair clipped close, the spot washed with a 2 per cent carbolic acid solution, and the canula is then steadily pushed through the skin into the vein, where it is held by the pressure of the thumb.

Inoculations may be practiced in the peritoneal cavity, in the plura, in the arachnoid cavity, etc. In the two former cases, the most simple processes consist in measuring the quantity, inserting the syringe through the walls until the cavity is reached, and emptying it by pressure. In the case of the arachnoid cavity, it is necessary to trephine the bone, of course, before operating.

Inoculation is also practiced in the anterior chamber of the eye — a delicate operation which can be successfully practiced only with a great deal of care, and by one well acquainted with the anatomy of the eye, and well equipped.

In order to test the properties of viruses, inoculations of this character are not alone sufficient; it is also necessary to try to produce the disease that is supposed to be due to germs, by causing their growth in the organs in which they usually occur in accidental cases. For example, in tuberculosis, infection may be provoked by inhalation of cultures and by ingestion, in order to sow the germs both in the lungs and in the alimentary canal. In various fevers, skin diseases, nervous affections, etc., etc., it is often required of the experimentalist or investigator to try means of inoculation or of infection, by the various channels through which the disease may take place accidentally.

In experiments by inhalation, the greatest care should be taken to prevent the access of the germs to the respiratory organs of the manipulator. Contrivances such as would be suggested by the occasion should be used with due consideration of the fact that powdered virus must not be allowed to float where men can breathe it. The animals should be in tight cages, and receive the air only through tight-fitting plugs of cotton in holes. To throw in the powder, use a long rubber tube entering the cage by a tight-fitting aperture, and attach an atomizer or a powder-blower at a safe distance. This kind of experiment is dangerous with all kinds of viruses, for we do not always know which are and which are not pathogenic to man. When it is known that a virus is pathogenic to man, such as tuberculosis, then no precaution can be too great. Numerous experiments can be made by the physician, student, and investigator, that cases and circumstances will suggest at the time. It is needless to say more on this point.

To Prevent Diphtheria. — It is believed that children may be prevented from taking diphtheria when the disease is prevalent in the neighborhood, or when it has broken out in the family, by spraying the throat every two or three hours with peroxide of hydrogen. The pure solution of fifteen volumes' strength should be used with an ordinary atomizer. It should be applied freely every two or three hours. This preparation is one of the best germicides known, and if thoroughly used in this way, will perhaps prevent the microbes, which are the cause of this disease, from obtaining a foothold in the mucous membrane. However, its use should not lead to neglect of isolation.

Dr. Smith has recently called attention to the fact that the complications which occur in scarlet fever may be prevented by the same means, if employed early.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE MORPHOLOGY AND BIOLOGY OF THE YEAST FUNGUS.

(Concluded.)

BY DR. JOHANNES RAUM, WARSAW.

Translated from the *Zeitschrift für Hygiene*, Vol. X, No. 1. by H. W. Loeb, A. M., M. D., St. Louis, Mo.

(*See Frontispiece.*)

VI. THE SMALL WHITE YEAST PLANT

(Figs. 63–67) differs in spore-formation from the white yeast fungus of Lindner. Their cells, generally spherical in form, often contain isolated black granules. (Figs. 63 and 64.) In the sprout-cells which still remain with the mother-cells, were observed these granules which seem disproportionately small in the beginning of proliferation. In yeast treated with plaster of Paris or in distilled water, spore formation and proliferation occur. The sprouts seem uncommonly luxuriant. I saw, frequently, mother-cells laden within ten sprouts. The yeast cells in these cases become funnel-shaped. This state is apparent when the preparation is treated in daylight with a two per cent solution of perosmic acid and short subsequent staining with Loeffler's methyl-blue (Fig. 65), while, after the use of perosmic acid alone for one hour, only a darker shade of this form results. The Ziehl-Neelsen carbol-fuchsin produces elegant pictures. These funnel-shaped vacuoles seem to be identical with the funnel-shaped forms described by Hansen. The spores are solitary, of a circular form, and possess small, black granules.

VII. SACCHAROMYCES GLUTINIS. (FIGS. 68–75.)

The cells, which are not large but oval, contain in the height of their development larger or smaller, more or less numerous black granules. They lie in part in the center and in part near the poles of the cells, sometimes single, sometimes united in larger collections. (Figs. 68–70.) In none of the forms mentioned did I observe spore-formation; on the contrary, I found in the older cells the funnel-shaped vacuoles already mentioned which exhibit the same reaction as the small white yeast fungus when treated with perosmic acid and methyl-blue. (Figs. 71–73.) In addition this form may be very small. (Fig. 72.) The proliferation seems to be of two possible kinds, by division of either the black granules or of the funnel-shaped vacuoles. (Figs. 74, 75.) I did not examine the process of fermentation.

VIII. YEAST OBTAINED FROM KEFIR. (FIGS. 76–81).

This form presents small dimensions. Correspondingly the black granules are much smaller than in the forms mentioned heretofore. In grouping and number they agree. It is worthy of note that in number and position of the granules in the sprouts, they resemble the mother-cells. (Figs. 76–81.) Neither spores nor vacuoles are visible. Fermentation not observed. Perhaps we deal, in this, with torula. (Hansen's opinion.)

IX. YEAST FROM SAUER KRAUT (FIGS. 82–90)

When isolated, appeared as round, somewhat large cells. In size, position, and grouping, these agree with what has been already said. (Figs. 82–84.) In old cultures wholly uncolored, vacuoles were observed, of which the protoplasm, together with the large granules therein contained, crowd along the cell wall, in crescentic forms. The cells often grow in length. The black granules, which are never wanting in the young sprouting cells (Figs. 87, 88), were found in some samples. In later stages of the development of the culture, we met lengthened forms without nuclei, which, however, could always be transplanted by proliferation. (Figs. 84–90.) No spores. Fermentation weak.

X. BLACK YEAST (FIGS. 91–99)

Presents no appearance of fermentation in sugar-containing solutions. It contains the black granules so interesting to us, sometimes in the middle and sometimes placed at the end. Vacuoles and sprouts occur, but no spores.

In older cultures a lot of sprouts are formed, which contain either a smaller or larger granule. When the individual cells increase, they throw out branches with mycelia visible on the transverse walls. They contain, in the neighborhood of this wall, granules which, however, do not exhibit the characteristic black coloring. (Figs. 91–99.)

In addition, pictures of the monelia candida (Figs. 100–106) are shown, which were obtained by staining with methyl-blue and Bismarck brown. I refrain from giving a description of these, preferring to recommend the detailed works of Plant and Roux-Linossier.

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DIPTHERIA AND GLANDERS BACILLI.[1]

INVESTIGATIONS CONCERNING THEIR DEVELOPMENT, AND THE COLORING OF THE LATTER IN SECTIONS, ACCORDING TO IMPROVED METHODS.

BY MAG-NONIEWITCZ.

Translated for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE by S. E. Weber, V. S., Lancaster, Pa.

IT has long ago been observed by many authors, that different kinds of bacilli do not in all cases retain their form, but in their development deviations will occur, that may be observed in the stained or unstained condition of the same. Few authors have given this matter sufficient consideration for a clear illustration. Heidenreich pointed out, that the tubercle-bacillus, in the true sense of the word, does not appear as a little rod, but always exists as a chain of round bodies, surrounded by a common sheath, and in form throughout appears as a little rod.

[1] Archiw weteriwarnuich na-uk (Archiv für Veterinarwissenschaften). (Aus dem bakteriologischen Cabinet des Dorpart Veterinar Institutes.) "Oesterreichische Monatsschrift für Tierheilkunde."

Una and Lutz observed a similarity in the syphilis and leper bacilli. Babes and Ernst say that in all bacteria special forms are contained, which, according to staining, and on account of being surrounded by protoplasm, make it plainly distinguishable, and in some larger bacteria of this special form, can be recognized without previous coloring. Through the work of Archangelski the same occurrence in anthrax is sufficiently illustrated, where in the blood they are found as micrococci; whereas those set forth from the culture of such blood contain beautiful unfoldings of anthrax bacilli.

Supported by these declarations the author deals with his own observations upon the development of the diphtheria and glanders bacilli.

The diphtheria bacilli, thriving in a nourishing substrata as well in the temperature of an ordinary room as in the "thermostat," were fully developed, and normal in the first two or three days, just as those described by Frænkel, Flugge, and others. In the following days appeared under the mass of the normal bacilli, some in a changed form, whose number increased until at last nearly all had taken on a form peculiar to themselves.

These changes of form began with this: that at the ends and along the body of the bacillus club-like thickenings made their appearance, that were hardly noticeable without staining. If we treat the bacilli preparation with a weak alkaline methyline solution and then with a weak solution of Bismarck brown, the thickenings will appear intense blue or black, and sometimes reddish-black; whereas the other part of the little rod will remain uncolored, or of a weak bluish tint. In the younger bacilli (say ten days old) in the stained condition they appear as little round nodules with irregular contour; older bacilli contain round, sharp-edged bodies. Shorter bacilli whose ends were thickened had the appearance of dumb-bells. Longer bacilli consisted of a row of round bodies. Those present between the round bodies in the unstained or slightly stained condition were apparently four-cornered, with their sides pressed in. The protoplasm between the little round bodies repels the staining material according to the degree of development of those bodies, and at last is fully indifferent to it, for it remains unstained and is not further visible, but still existing. We can conclude from this, that those consisting of little chains of 2, 3, 4, or more micro-

cocci, misplaced by artificial movement, still remain in coherence. In old cultures of diphtheria bacilli, such little bodies exist in large numbers, and yet the author was not successful in keeping them separate in his cultures.

In cultivated glanders bacilli a similar process is found. In their course, the same case was observed, *i. e.*, the appearance of little round bodies that were intensely stained, and whose development was more rapid than that of the diphtheria bacilli. Their sides remained regularly parallel, and only very seldom were unimportant thickenings observable.

In the glanders bacilli appear occasionally, at one end, a little round body which does not occur in the diphtheria bacilli. These bodies are not so regularly placed in the glanders bacilli, but those in the intermediate space are of various size. The breaking up of this small body of the glanders bacillus, is brought about very slowly and only toward the period of its full development. In the more abundant breaking up, we observe a weakening of the life process and virulence of the little rods.

During all these changes the bacilli still remain mobile in the same degree. The development of little round bodies in the glanders bacilli is not one of accident, and only apparent in the culture process; but the same is also met with, when they are developed in other media, as in the organism of an affected animal. In unstained preparations we observe, in the first place, only little rods, and in most of them also little round glistening bodies, reminding one of micrococci.

In the stained preparation we observe, in the first place, glanders bacilli exclusively; in the next place, bacilli and intensely colored granular micrococci; and in the third place, the bacilli are wanting, but instead, micrococci are present in vast numbers. Glanders bacilli with fully preserved contours of two or three diameters, containing intensely colored bodies, were easily found in matter from a glanderous ulcer, or nodule, from a guinea-pig that had been affected for four or five weeks, or from a sub-acute case of glanders in the horse. Normal and uniform colored glanders bacilli without mixture of micrococci were observed in man, in field-mice, and in guinea-pigs that had been sick two or three weeks, and in a case of acute glanders in a horse. Considering the same form of glanders, where micrococci only were met with exclusively, we may point out that these forms happen in the course of a chronic case in the horse. We find, then, in glanderous matter, the bacilli, separate from which are a number of micrococci, whose diameter does not exceed, generally, the thickness of the bacillus, and yet we meet micrococci with larger diameter. Thin sections will almost always show that besides micrococci, can be pointed out a few bacilli which contain little round bodies.

Free micrococci were very seldom found separately, but mostly formed in colonies of various sizes. These micrococci appear somewhat larger than those inclosed by the bacilli, and in the smallest colonies we can recognize them as being placed two or three in a row. From these results, in reference to the changes of the glanders bacillus in animal stroma, the author draws the following conclusions: —

First, the glanders bacilli have in the first stages of their development (in acute cases) all the qualifications of the characteristic bacillus.

Second, there appear (in the cause of a sub-acute case) in the bacilli, peculiar little round bodies, which are easily broken and color intensely, while the protoplasm in this stage will color only feebly. At the same time are found present in small numbers, free little round bodies.

Third, finally (in chronic glanders) we find little round bodies predominating and only very few bacilli, which at the same time contain little bodies. In this, the fixed process is fully analogous to that of the glanders bacilli, both in the culture preparation and in the animal organism; the only difference being that the development of the little round bodies and the breaking down of the bacilli occur incomparably slower in the animal economy than in the culture preparation.

As to the nature and vegetative properties of the little round bodies of the diphtheria and glanders bacilli, the author was unable to determine anything positive.

For each case, in the foregoing results of microscopical diagnosis of glanders in the horse, the author thought he could always find room for further consideration. He must be content thus far with this account of the characteristics of the specific bacilli of glanders, a certain diagnosis of which is as yet very difficult to make, while they are sometimes wholly absent in the horse, and are only met with as micrococci.[1]

[1] See Method of Staining, Technique, in this number.

Pyoktanin for Ozæna.— Dr. Demme, assistant to Frænkel, of Berlin, claims excellent success in the treatment of ozæna by the use of a 20 per cent mixture of pyoktanin and lanolin. The ointment is applied by means of a little tampon of cotton, with which a sort of massage is applied to the interior of the nose, the application being continued about one half minute to each nasal cavity.

Methyl-Blue in Acute Nephritis.— P. Netchaïen, of Moscow, reports success in the treatment of acute Bright's disease by the administration of methyl-blue. Three doses of one half grain each of methyl-blue are administered daily. The immediate effect of the remedy was to quadruple the quantity of urine secreted, the patients passing 3200 to 3600 c. c. daily. The albumen casts and general dropsy as well as cardiac and pulmonary symptoms quickly disappeared. A complete cure was secured in from nine to seventeen days in the three cases tried by this method. The idea of the author is that the remedy acts by destroying the microbes upon which the disease depends.

Immunity and Treatment of Swine Erysipelas and other Infectious Diseases.[1]— Doctrines on the subject of immunity abound. It seems that every investigator who finds a means of preventing a disease by some method or other, concludes that he has discovered *the* cause of immunity. This comes perhaps from the universal desire to be the discoverer of the great principle. Few stop to think that all the modes of conferring immunity, so far, are only so many different processes which in their time need explanation. In our opinion, Dr. Mc Laughlin, of Austin, Texas, has given expression to the truth concerning the underlying laws of immunity! However, every one of these studies and processes adds to our practical means of preventing disease, and is therefore of great value.

Ascites with Abdominal Tumors. —Ascites not infrequently exists with large abdominal tumors in consequence of an obstruction of abdominal circulation arising from the weight of the tumor. But there are cases in which ascites is present with a comparatively small tumor. I have met two cases of this sort in which the amount of fluid which was withdrawn from the abdominal cavity at the operation, was 36 pounds in one case, and 30 pounds in the other. A pedunculated fibroid in the first case, weighed 5 pounds, and in the second case, a double papilloma weighed 2 pounds. In the first case, 250 pints of fluid had been withdrawn by tapping within three months. M. Pascal (*La Semaine Medicale*) considers that ascites in these cases may be due either to tortion of a pedicle and great mobility of the tumor, causing friction in the peritoneum, or an excessively rapid growth of the tumor, causing a stretching of the investing structure of the peritoneum. Tumors of the omentum are likely to be accompanied by ascites.

J. H. K.

Creosote in Pulmonary Tuberculosis.— Sommerbrodt, a German physician, in the *Berliner Klinische Wochenschrift*, recently gave a summary of his experience in the use of creosote in cases of pulmonary tuberculosis, during the last nine years. He employs it as a remedy in doses of from 1–4 to 15–50 grams daily. He administers the remedy by the stomach in divided doses, beginning with a very small dose, and gradually accustoming the patient to its use. He considers this creosote (pure beech-wood) the most valuable of all medicinal agents in the treatment of tuberculosis. He reports complete cures in the early stages of the disease. He has employed creosote as a remedy for thirteen years, and with increasing confidence. We have, for some time, made use of beech-wood creosote in cases of pulmonary tuberculosis, employing it as an emulsion with the yolk of egg, by enema; found no difficulty in using ¼–1 gram doses, administering the medicament at night at the hour of retiring. We have commonly employed this remedy in the form of an emulsion, and the results observed have been very excellent; in several instances the number of bacilli have been materially lessened, the patient has usually gained in flesh, night sweats and fevers have diminished, and there has been a marked improvement in the general condition of the patient. In some cases, however, the disease has been so far advanced before treatment that only temporary benefit has been secured. A more extended report of these cases will be given at a future time.

1 See August and September (1891) numbers, BACTERIOLOGICAL WORLD.

Acetic Acid in Chronic Laryngitis. — Dr. J. Scheimmann, of Berlin, reports success in the treatment of cases of chronic laryngitis by means of inhalations of a 2 per cent or 3 per cent solution of acetic acid for ten minutes two or three times a day. A little of the same solution was injected into the larynx every day. Under this treatment the thickened membrane in the larynx became softened, and the thickening disappeared.

The Micro-organisms of Undergarments. — Dr. Hobein, in *Zeitschrift für Hygiene*, Vol. X, p. 218, reports that he has investigated the relative receptivity of clothing for the micro-organisms found in the body. He has observed that the relative freedom of clothing from the microbes with which they come in contact upon the skin, depends upon physical qualities ; that is, the denseness or looseness of the texture, the folds that it may form, its thickness, and its power of shrinking after washing. He concludes that flannel retains more microbes than any other texture, containing from three to six times more germs than linen or cotton fabrics. Woolens exposed to vapors, retain a great many more germs after washing than before ; silks, on the other hand, are not modified. The author attributes this difference to the well-known property of woolens to shrink after washing. Dr. Hobein concludes that dense textures should be considered the most proper, from a bacteriological standpoint, hence the necessity of using this kind for surgeons' aprons.

We should think this also an indication to nurses, concerning the proper material to wear. It would probably be irrational, however, to conclude from this observation, that underclothing should not be made from woolens, even though such cloth retains more microbes than silks, cottons, and linens ; indeed, as expressed by a critic of the report, perhaps this very fact should influence one to choose woolen undergarments in preference to other textures,— their receptivity for microbes, and their property of retaining them, constituting a means of purifying the surface of the body not to be rejected.

Fever by the Action of Soluble Pyocyanic Substances. — M. Charrin presented to the Academy of Science of Paris, through M. Bouchard, a note in which he states that the injection of the soluble substances of the pyocyanic bacillus produces a reaction such as Koch's lymph produces. One of the principal symptoms of this pretended reaction consists in the elevation of central temperature. This symptom has been observed by M. Charrin in patients who receive the microbic substances manufactured by the pyocyanic bacillus, which is very different from the bacillus of tuberculosis. He makes the following reports : —

"An adult affected with pulmonary tuberculosis in the third degree, entered the Laribòisiere Hospital. The 8th, 9th, and 10th of September, 1891, this patient had hemorrhages of the lungs. The 11th, in the morning, the blood reappeared in abundance in expectorations. At 10 o'clock, during full hemorrhage, we injected under the skin 3 c.c. of soluble products (of the pyocyanic bacillus). From this moment the blood ceased to appear. About noon, it was thought prudent to administer again, 3 c. c. At 1 o'clock the patient is suddenly taken with shivering, dyspnœa, with profuse transpiration, etc.; the rectal temperature, which was slightly under 102° F. in the morning, went up to near 106° F. During the evening, the accidents gradually subsided. In the morning the thermometer had descended to its habitual degree of the preceding days."

M. Charrin states that this patient had other hemorrhages, and that all were arrested by the same injection; but knowing by this experience the danger of large doses, the injections did not exceed, after this, 1 c. c. to 2 c. c., under which no fever of importance arose.

"The 9th of September, 1891, a young girl recovering from typhoid fever, received 2 c. c. of pyocyanic toxin. At the moment of this injection in the morning, the thermometer registered slightly below 100° F. It arose during the evening of the night following to nearly 104° F. ; it fell again, at the expiration of thirty hours, to 100°."

M. Charrin gave other instances of the injection of pyocyanic toxin followed by high fever, and says that it would be easy to multiply such instances.

Besides the importance of this discovery of the reaction produced by other bacterial products than those which were at one time attributed only to Koch's lymph, these results indicate the direct value of bacterial products in therapeutics. They support the theories advanced by M. Bouchard, concerning the action of microbic matters in arresting hemorrhage by their effect on the vaso-dilator and the vaso-constrictor centers.

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

Influence of Temperature on the Bactericide Action of Light. — A great number of investigators, including Roux, Tyndal, Duclaux, and Strauss, have investigated the influence of light upon microbes. More recently Mr. Santori Saverio (*Annali dell' Instituto d' Igiene Sperimentale dell' Universite di Roma*, Vol. II, Series 2, p. 121) has taken up the question with special reference to the influence of temperature on light and its bactericide action. The following is the conclusion to which he has arrived: —

1. The bactericide action of solar heat manifests itself with great energy, even when it is not accompanied by an elevated temperature.

2. The violet and red rays of solar heat, isolated as much as possible by means of colored glass, do not cause the death of micro-organisms, nor any visible changes in their development.

3. Micro-organisms resist longer the action of solar heat, in a desiccated state than in a damp or humid condition.

4. There is no notable difference between the time necessary to sterilize a culture of charbon spores and that required to sterilize a culture of charbon bacilli.

5. The action of solar light is the more rapid the higher the temperature.

6. The action of electric light furnished by a lamp of 900 candles and kept within 80 centimeters of the culture, is much inferior to solar light.

7. The spores of the bacilli of charbon exposed to this electric light in a dry state at a temperature between 18° and 20° C., or between 66° and 68° F., are still alive after 24 hours.

8. When, on the contrary, the temperature was between 40° and 44° C., (or 104° and 111° F.),— a common thing in culture-tubes exposed to the sun,— their death occurred after and between 12 and 24 hours.

The Influence of Wood-smoke on the Life of Bacteria. — Mr. Tassinari, who established, some time since, the bactericide action of tobacco-smoke, was followed in this line of experiment by Serafini and Ungaro (*Annali dell' Instituto d' Igiene Sperimentale dell' Universite di Roma*, Vol. II, p. 99), who experimented with smoke, such as is used in the preservation of foods, such as smoked meats. Mr. Forster had already made analogous experiments with tuberculous meats, by which he proved that ten days of smoking the meat did not destroy the germs of tuberculosis. Messrs. Serafini and Ungaro tested the influence of smoke on the bacilli of charbon, the staphylococcus pyogenes aureus, and the bacillus subtilis, and they found the two first-named were killed after 2½ hours, the last after 3½ hours, and the spores after 18 hours. The temperature was compatible with the life of the organisms, or about 77° F. Desiccation was not notable, either. Experiments touching on the action of the different products of incomplete combustion, bring them to the conclusion that it is not the carbonic acid, nor the acetic acid, nor the nitrous acid, nor nitric acid, nor ammonia, which confer the bactericide property to the wood-smoke, for they were excluded from this smoke, but that it was due to the empyreumatic products they contained.

A New Toxine in Urine.— Griffiths, of Edinburgh, who has been studying the ptomaines eliminated by urine in scarlet fever and diphtheria, reports, among other toxic agents, the discovery of an extremely poisonous substance which is closely allied to creatinine, one atom of hygiene in the creatinine being replaced by the radical propyl. It is curious that a comparatively inoffensive substance should become so intensely poisonous as to be capable of producing death within a short time after administration, under the influence of the microbes peculiar to diphtheria or scarlet fever. A practical suggestion growing out of the observation, is, that it would be well to withhold beef tea, beef extracts, and the use of other meat preparations, as well as solid flesh foods of all kinds, in cases of scarlet fever and diphtheria, and to substitute milk, fruit juices, and farinaceous foods, which are generally recognized as being more suitable for patients under most febrile conditions.

Klebs has made a similar observation respecting cholera nostras, having discovered a ptomaine which proves to be methylguanidine, an extremely poisonous substance evidently derived from guanidine, a substance possessing very little toxic power.

Certain Actions of Tuberculine. — Messrs. Bouchard and Galezowski, in numerous experiments, have recognized that Koch's tuberculine contains a substance which always provokes vascular dilatation with exudation and diapedesis, but chiefly in regions where its effects are solicited by a local irritation, as in local tuberculosis. In rabbits, tuberculine produced albuminuria, hematuria, peptonuria, renal congestion, and pulmonary congestion. Sometimes, in sound animals, veritable pulmonary catarrhal affections were produced, and pulmonary congestions with diapedesis. It always produces, in the sound guinea-pig, a notable dilatation of the vessels of the papilla of the optic nerve. An extensive and very interesting explanation of these and many other facts concerning tuberculine are published in the *Comptes Rendus* of the Academy for October, 1891, pp. 524–529.

The Leprosy Bacillus. — According to a recent number of the *Indian Medical Gazette*, Drs. Rake and Buckmaster, members of the Indian Leprosy Commission, have at last succeeded in cultivating the leprosy bacillus. This has been many times before attempted, but without success, although the bacillus itself has long been familiar to bacteriologists, the tissues of leprous patients being found crowded with the microbes, which in some respects closely resemble the bacillus of tuberculosis. The medium through which the experimenters succeeded in growing the bacillus, was a serum obtained by means of a blister. The secondary growths or cultures of bacilli, were obtained upon agar-agar and gelatine. Experiments in inoculation are being made, but reports of results have not yet reached us.

The Microbe of La Grippe. — Cornil and Chantemesse (*La Semaine Medicale*) assert that the microbe recently described by Pfeiffer, of Berlin, was described two years ago by Babes, a little later by Kovalsky, and by Canon simultaneously with Pfeiffer. In a recent study of the subject made by themselves, they injected a drop of blood from an infant suffering from the disease, into the vein of the ear of a rabbit; the next day the microbes were found present in the blood of the rabbit in great numbers. A careful measurement of their length showed it to be about one twentieth of the diameter of a red blood corpuscle, or about one sixty-thousandth of an inch.

The bacillus was found to grow well in sweetened bouillon. A large monkey was inoculated by throwing two drops of a culture in bouillon into the nasal cavity. The result was a severe attack of *la grippe*, in which the bowels were affected by a profuse diarrhea. The bacilli were found in the blood of the monkey in great numbers. The febrile state of the disease continued two or three days, and then it was followed by a period of subnormal temperature, as in human beings.

The disease in rabbits is longer continued; the animals become emaciated, lose their appetite, and retain the bacilli in the blood for two or three weeks.

The bacillus of influenza seems to predispose the system to attacks from the various other microbes, which is the cause of the frequent complications which attend this disease.

When grown in bouillon, the microbes do not destroy the transparency of the liquid, and hence the growth is scarcely appreciable to the naked eye.

The bacillus of influenza is very difficult to distinguish because of its extreme smallness, and the difficulty of staining it. The culture grows slowly at 37° C. (98.6° F.) in gelatine and in sweetened bouillon, but it is with difficulty transmitted from one culture to another in artificial media.

The Bactericide Property of Urine. — In the *Centralblatt für Bakteriologie und Parasitenkunde*, Vol. VIII, p. 457, Prof. Lehman gives his opinion based on experimentation, concerning the bactericidal property in the fresh urine of man. It had been observed, many times, that the germs of infectious maladies are seldom found in urine, whereas they frequently infest the kidneys. This was attributed to the filtrating action of the kidneys. Prof. Lehman jointly with Dr. Richter, has discovered that urine is really germicidal, and that to this, probably, is due the fact that infectious maladies rarely contain the germ of the disease itself. These experimentalists believe that the bactericide action is due principally to the acid phosphates contained in the urine; for neutral urine is generally devoid of this quality, while a solution of these salts at the concentration found in the composition of urines has the same bactericidal property.

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"DANGEROUS SCIENCE."

UNDER this caption, the *Farmers' Review* gives warning against the conclusion of Dr. Henry F. Formad, of New Jersey, who, after examination of the milk and meat of tuberculous cattle, takes a decided stand in opposition to the prevailing views upon the subject. He says that he is convinced that the dangers arising from the use of the milk and meat of cattle affected by tuberculosis, are much overdrawn. Experiments were made upon some guinea-pigs which were inoculated in the anterior chamber of the eye with milk, and after eight weeks no tubercle bacilli were discovered. He also made examination of the meat of cattle, but has never been able to find the germ. Apropos, the *Farmers' Review* says: "Some of our scientists are apt to carry their investigations of disease to dangerous conclusions; dangerous, because people are inclined to take for granted as absolutely correct, all the finding of such men, whether it be plausible or not."

This point is well taken. It is true that numerous scientific investigations come before the public in such language as to mislead the masses. We have no doubt whatever that the results of Dr. Formad justify his conclusions, but they do not justify the conclusion that tuberculosis is not transmissible from cattle to human beings. It may be true that in the public mind, and among general practitioners, the dangers have been overestimated, but it is certainly not so among those who have studied the question closely and calmly. The many reports made to the late Congress of Tuberculosis in Paris, have demonstrated as positively as can be, in view of the nature of the malady, that tuberculosis is transmissible from animals to man, and is transmissible from man to animals, and also between animals. Dr. Formad's experiments merely prove that in his cases he has failed to transmit the disease by inoculation and to discover the germs in the diseased animal. This negative result cannot disprove the great number of positive results previously obtained by a great many investigators, of undoubted ability and of unquestionable reputation. Indeed all the negative results that can be adduced by experimentation or observation could not disprove one positively authenticated affirmative result. So it comes to this: Dr. Formad's observations show, probably, that the disease is not as universally dangerous, so far as transmission from cattle to man is concerned, as is generally supposed by the public, in the sense that perhaps not as many cases of tuberculosis originate from this source as is generally supposed. I say "*probably*," and I use the further word "*perhaps*" purposely, because the evidence is not sufficient to warrant the unqualified acceptation of the conclusion.

It requires a great number of experiments and investigations on a subject of such vast proportions and possibilities, to establish an entirely reliable conclusion. And after a sufficient number of inquiries of the most critical character have been conducted for a sufficient length of time, the fact will still remain that tuberculosis has already been proven contagious, therefore transmissible, and that the tubercle bacillus which is found in human tuberculosis, or consumption, and that which is found in cattle tuberculosis are identical. The disease is the same, and due to the same virus; it follows that its transplantation is liable to take place from animals to man. No amount of re-

search can disprove this already established fact.

The great need to-day is for scientists to put their shoulders to the wheel with more unanimity, having at heart the good of the public rather than private advancement and glorification. It is far from our purpose to attribute personal motives to the print of Dr. Formad. There is no question that his work has been done very sincerely and well. We make this remark simply because, in a general sense, when one examines the numerous monographs and publications that come to the editor's table, one feature strikes the mind at once, and that is, that the public, for whose good all scientific advancement should be directed, receives abstract reports, from which erroneous conclusions are often deduced. It is evident, from the publications of the public press, that Dr. Formad's print has resulted in creating the impression very generally, to the effect that we need not fear tuberculous cattle or milk from such animals. Certainly this is not warranted by his experiments, and we believe that Dr. Formad does not give color to any such conclusions. What the people need to be guided by, is just the reverse of this impression, which is true, viz., that tuberculosis is contagious, liable to be transmitted from animals to man, and therefore we cannot take too much care in isolating all centers of infection, no matter of what character. P. P.

ACTINOMYCOSIS.

The famous case of J. B. Greenhut and others, *vs.* the Members of the Live-stock Commissioners of Illinois, to recover damages alleged to have been suffered by the plaintiffs by reason of the quarantine of certain cattle affected with actinomycosis, and the subsequent disposition of the same, better known to the public under the name of "the lumpy-jaw cattle-case of Illinois," has attracted universal attention, not only in this country, but in foreign countries. A great number of experts were called by the defence to prove the contagiousness of this malady, and a few were called by the prosecution to disprove this fact. It is noteworthy that the latter gentlemen, though declaring upon oath that they did not believe in the contagiousness of actinomycosis, admitted upon cross-examination that the disease is due to a germ or parasite.

The unfortunate fact about this question of actinomycosis lies in the denial, by a few physicians and veterinarians, of the specific, transmissible nature of this malady. In reading the testimony closely, one is forced to the conclusion that the very same men who deny the contagiousness of the infection must have a wrong conception of what contagiousness means in a general sense in the public mind, and at the same time realize that the disease is truly transmissible, since they admit that it is either microbic or parasitic. The general public do not make all the fine distinctions of the medical world, in speaking or thinking or treating of diseases. The word "contagious," with the laity, is a synonym of the word "catching," or transmissible. It does not matter by what particular means transmission takes place; it is the fact of the transmission itself which is the all-important one, and it is this fact, too, that scientists who are truly desirous of benefiting humanity should take into account. The members of the medical and veterinary professions may have different views on a number of details on the subject of the pathology of actinomycosis and the physiology of the parasite that produces it; but there is not one of them, if he has studied at all, who can successfully deny, or even doubt, that the fungus known as actinomycosis is in reality the producer of the affection. This being known and realized by every one, it follows that the malady must necessarily be transmissible in one way or another. It is not necessary even to make extensive investigations and observations to verify this logical conclusion, to which the very nature and etiology of the affection forces

one. It is, therefore, to say the least, strange that any scientist can take the stand, and upon oath declare that actinomycosis is not contagious, knowing all the time that when he says, "Not contagious," in the court-room, the public, ignorant of technical terms, supposes he means, "not transmissible."

But even if the disease were not contagious, is it not wrong for medical men to pursue a course that is liable to lead the public to ridicule hygienic laws, and to make light of the strenuous sanitary efforts made throughout the world to prevent humanity from eating diseased meat of any kind? Is it not indeed unsafe for the people to eat flesh from an animal suffering even from a non-specific disease? Is it not dangerous, under certain conditions, to eat even the meat of a healthy animal, when it has been affected by micro-organisms after death? Should we not therefore direct all our efforts toward educating the people to the end that all diseased meats, no matter what the malady, are unwholesome? There is no occasion for extreme or sensational teaching, but the truth should be told. Even the experts who hold that they would not fear to eat meat from cattle having suffered from actinomycosis are morally wrong in teaching to others that such a thing is safe and wholesome. They know themselves that it is not safe; and even though actinomycosis may not be transmitted to one case out of ten thousand people who partake of the affected flesh under the conditions attendant on the preparation of meat for the table, this does not destroy the fact that it is sometimes transmitted, or liable to be, and that the flesh itself is unwholesome and unfit for human food. The Board of Live-stock Commissioners of Illinois has shown a determination equaled only by the manly spirit and the strict conscience of its members and Secretary. They have been untiring in their efforts, and, through them, the medical world and the public have been put in possession of more facts concerning actinomycosis than were ever before published at large. It is to be hoped that they will continue their endeavors until the truth is accepted.

After having the case under consideration forty hours, the jury reported its inability to agree,—a fact due, in no small measure, to the conflicting testimony of the experts of the prosecution, who, admitting the parasitic nature of the affection, denied that it was contagious or transmissible. P. P.

MISDIRECTED SURGERY.

Some years ago, when a pupil assistant to Mr. Lawson Tait, in a conversation one day respecting the proper indications for an operation of ovariotomy under different conditions, Mr. Tait referred to the excessive frequency with which the operation was being performed by some American surgeons, especially by tyros who had had no adequate preparation for this important branch of surgical work, and whose operations must, to a large extent, be denominated mutilations rather than scientific surgery. Mr. Tait remarked that the same state of things prevailed for a few years after he first demonstrated the necessity of removing the uterine appendages for other diseases than tumors of large size. As an illustration, he mentioned the following circumstance: Having read a paper before a certain English medical society upon diseased ovaries, and subsequently visiting the same society at one of its meetings, he was greeted by a number of physicians with soup-plates full of ovaries which they triumphantly presented, but which were, almost without exception, perfectly healthy organs. If a careful pathological examination were made of the ovaries removed by some operators in other countries besides England, a state of things somewhat similar, though we trust not quite so bad, might be discovered.

In England, the activity of professional rivalry, and the influence of some success-

ful suits for malpractice based upon an unnecessary operation for removal of the ovaries, have brought about a healthy change, so that, at the present time, the people as well as the profession recognize the fact that every surgeon is not an ovariotomist, and has not the moral right to undertake operations of such gravity as those which involve the opening of the abdominal cavity, without having first secured to himself the necessary opportunities for becoming a competent operator in this line of surgical work. As a result, patients upon whom this operation is performed usually fall into the hands of competent and reliable surgeons, and unnecessary ovariotomies must be comparatively rare. It will be fortunate for the women of America when a similar state of things comes to prevail in this country. The rashness with which some surgeons recommend to their women patients the operation of ovariotomy, and the apparent delight displayed by some operators in cutting into the abdomen, is truly appalling to all intelligent and conscientious medical men. Many a patient's life has been sacrificed to this reckless, and we might even say criminal, surgery. If the laity knew one half the truth upon this question, it would be sad for the medical profession, as respect for the profession as a whole would be lessened, since the public do not discriminate closely between an honest, competent medical man and an adventurer who has invaded the sacred precincts of medicine, as a commercial enterprise, and with no other aim than a mercenary one.

In our opinion, every ovariotomist ought to preserve what he removes as an evidence of the necessity for the operation performed. This has been the custom of the writer for years, and it is a practice which not only affords the honest operator the best possible justification of his work, but is also greatly in the interest of science, as it facilitates careful comparison of the morbid conditions with symptoms and the results of operation.

J. H. K.

To Render Tobacco Harmless. — *Science,* in a recent number, publishes the following: —

"Smokers may be pleased to learn that Dr. Gautrelet, of Vinchy, claims to have discovered a method of rendering tobacco harmless to mouth, heart, and nerves, without detriment to its aroma. According to him, a piece of cotton wool steeped in a solution (5 to 10 per cent) of pyrogallic acid, inserted in the pipe or cigar holder, will neutralize any possible effects of the nicotine. In this way not only may the generally admitted evils of smoking be prevented, but cirrhosis of the liver, which, in Dr. Gautrelet's experience, is sometimes caused by tobacco, and such lighter penalties of over-indulgence, as headache and furring of the tongue, may be avoided. Citric acid, which was recommended by Vigier for the same purpose, has the serious disadvantage of spoiling the taste of the tobacco."

It is a pity that science should have to search for antidotes for poisons used by man, for absolutely no other purpose than the gratification of an unnatural appetite or passion. It may be true that the effects of nicotine will, in a manner, be neutralized by this antidote, but the fact remains that the useless appetite is not destroyed, and that the satisfaction of it must still continue to draw on the system in various ways, notably, by the extraordinary and harmful salivation. P. P.

Tobacco Insanity and Nervousness. — A terse monograph from the pen of Dr. L. Bremer, one of our honored collaborators, has recently reached us. It is a pamphlet based upon an article read before the St. Louis Medical Society, in October, 1891. The doctor writes from personal observation, and personal knowledge of the effects of tobacco. He himself used the weed for a long time, and gave it up, under the conviction that its effects were baneful. He has also had years of experience in dealing with the insane of the St. Vincent's Institution,

St. Louis, Mo. The pamphlet will be read with a good deal of interest, and will do much good to those among whom it may circulate. To demonstrate the convictions of the author, I quote from one of his pages: —

"That tobacco really does cause insanity, is evidenced by the magic effect seen in some cases after a discontinuance of the drug, when the patient's condition is still such that he is not wholly inaccessible to reason, and has will-power enough to abandon the habit. Thus, I have seen the beginning of melancholia with suicidal impulses, hallucinations of various kinds, forced actions, besides the precursory symptoms of insanity, such as insomnia, crying spells, præcordial anxiety, fears of impending evil,— that 'something is going to happen,'— impotency, vertigo, beginning of impairment of memory and judging-power, and even the lowering of the moral tone,— all of which, and a host of other symptoms were attributable to chronic tobacco intoxication. This appeared after freedom from the habit was established." P. P.

The Germicide Properties of Cinnamon. — It is printed throughout the country that M. Chamberland, of Pasteur's Institute, in Paris, has discovered the antiseptic power of the essence of cinnamon. He claims that it destroys all kinds of germs in a few hours. It is not the first time that this fact has been brought before the public. It is said that it was used long ago, during the plague in London. It is doubtful, however, whether the rationale of its use was understood; it was rather an empirical practice. Science has now explained the ground for its beneficial effects. It is recommended, as a consequence, that a decoction of cinnamon be taken freely by persons living in places affected by typhoid fever or cholera.

We might go further, and say that possibly it would be a fine disinfectant of the mouth. Cinnamon bark could be chewed, and the essence could be used by itself with a tooth brush. The nature and origin of certain maladies, such as diphtheria, suggest that if people would cleanse their mouths thoroughly morning and evening and after each meal, using a borax solution, say for rinsing purposes, and a few drops of cinnamon essence on the brush afterward, the germs of this disease would likely be destroyed. A number of other germs enter the system through the mouth, and could be destroyed by proper antiseptics. Among these, may be included the bacillus of tuberculosis, the pneumococcus, and various parasites of the alimentary canal, among which quite a number develop in the mouth first, and then are swallowed down with water or food, or enter the air-passages with the flow of atmospheric air inhaled. The properties of cinnamon in such cases, make its use practical and rational. Common salt as a tooth powder, is an excellent antiseptic, as is also bicarbonate of soda. P. P.

Two Newly Observed Peculiarities of Feminine Physique. — In comparing the results of the strength measurements of each important group of muscles in the body for one hundred men and one hundred women, two facts are very conspicuous: —

1. As a uniform law for men, the total strength of the arms is found to be almost precisely two thirds of the total strength of the legs, while in women the total strength of the arms is scarcely one half the total strength of the legs.

2. Comparing the muscles of the upper chest (pectorals) in the average man and average woman, the woman is found disproportionately strong in this region. For example, the strength of the pectoral muscles of the average woman is found to be 61 per cent of that of the muscles of the average man, whereas the total strength of the arms in an average woman is only 47 per cent of the total strength of the arms in the average man.

J. H. K.

REVIEWS.

The Physicians' Leisure Library. — Detroit, Geo. S. Davis. The publisher of the *Physicians' Leisure Library* has certainly shown remarkable tact in selecting popular and practical medical subjects, and presenting them to the medical profession in a form so attractive and convenient, and so cheap that it is no wonder the appreciation of the profession for literature in this form has been shown by the rapid and enormous sale. We have recently received the following numbers of this series: —

Infectious Diseases, by Carl Liebermeister, in two volumes, treating on miasma and miasmatic contagious diseases, intermittent fever, typhoid fever, measles, scarlet fever, smallpox, vaccinia, varicella, rubella, and diphtheria. The author presents many ideas new to American readers, and the volumes are well worth perusing.

The Etiology, Diagnosis, and Therapy of Tuberculosis, by Prof. H. Von Ziemssen. The views expressed in this work are based upon the theory of the bacillary origin of tuberculosis, of Prof. Koch, and are a great advance over the teachings of the older text books. In an interesting discussion of the heredity of tuberculosis, the author mentions the interesting researches of Bollinger, of Munich, who found the tubercle bacilli frequently present in the lymphatic glands of children who had died of measles, especially the glands located about the root of the tongue. These children had previously been apparently healthy, neither tuberculous nor scrofulous symptoms being present. This observation explains the frequent occurrence of tuberculosis after measles, and emphasizes the folly of those mothers who think it wise to expose their children to measles while young, so that they will not have the disease when old. Measles does not introduce the tubercular germs into the body, but calls into activity those which are present, which, without such an exciting cause, might be entirely destroyed by the tissues.

Bright's Disease, by A. L. Loomis, M. D. This is an admirable *résumé* of what was known upon this subject at the time the work was written, in 1888. We are glad to notice that the author makes use of the interesting and remarkable observations of Bouchard respecting urinary poisons, and their possible influence upon the kidneys.

The Treatment of Morphia Disease, by Erlenmeyer. This little manual consists of a single chapter in the compenduous work on the "Morphia Habit" published by Dr. Erlenmeyer, and relates solely to the treatment of this psycho-neurosis. The work is eminently practical, and the method of treatment for the most part agrees with the method which the writer has worked out and has been employing for the last fifteen years; namely, quick withdrawal, — that is, withdrawal of the drug within a few days, instead of extending the attenuation of the doses for some weeks, as is proposed by some. The writer has found this method far more satisfactory, and involving less discomfort to patients, than any other, and has rarely observed any degree of suffering, the severest symptoms being readily controlled by warm baths, massage, applications of electricity, and other non-medicinal measures of treatment. Little benefit has ever been observed in the use of substitutes.

Dyspepsia, by Frank Woodbury, M. D. This is really a very practical little work, and we take pleasure in noting that the writer gives special prominence to the hygienic treatment of disease, and is familiar with the researches of Bouchard, and those of most other recent and reliable authors. We cannot agree, however, with the statement of the author in his introduction, in which he says, "Comparative anatomy shows that man's digestive apparatus in its type repeats characteristics found both among the carnivora and the ruminants," from which he concludes "that for him a mixed diet is most suitable." A further study of the subject

from the standpoint of comparative anatomy would, we feel sure, have convinced the doctor that man is not a mixture of the carnivora and the herbivora, a sort of cross between these two races as regards his teeth and his diet, — a dietetic hybrid, so to speak, — but is himself a typical representative of a special class of animals, in which he is associated with the monkey and man-like apes, such as the gorilla, chimpanzee, and allied species. These animals constitute a class by themselves, the frugivora, the peculiar characteristics of which find in man the highest and most perfect type. If comparative anatomy proves anything whatever respecting the habits of any class of animals, it distinctly declares the human race to be naturally frugivorous rather than semi-carnivorous.

How to Disinfect Our Homes, by Dr. B. W. Palmer. This brief manual sets forth the germ theory, the theory of antisepsis, the relative value of the various germicides, and the principles to be regarded in the use of antiseptics and disinfectants, with practical directions for the application of disinfectants. It is a very practical little manual, which has doubtless saved many lives.

Microscopical Diagnosis of Tuberculosis.— By Paul Paquin, M. D., Little Blue Book Co., Battle Creek, Mich. One does not need to read more than a page of this concise little work to recognize the fact that the writer is master of his subject, and not only knows how to study bacteria, but also has a remarkable faculty for imparting the results of his studies, and knowledge gleaned from the work of others, to those who wish to make themselves familiar with this new but highly important branch of medical science. The work is so concise and practical that it embodies within 48 pages, comprising 12 chapters, all that it is really necessary to know for the microscopical study of tuberculosis. The following are the headings of some of the principal chapters: "The Microscope and Other Instruments," "Principle, Object, and Effect of Staining," "Mounting," "Collecting Sputum," "Staining Fluids, and Their Use," "Modus Operandi," "Staining Bacilli of Tuberculosis in Milk, Pus, Articular Secretions, etc.," "How and What to See through a Microscope," and "The Bacilli of Tuberculosis." Two other chapters, entitled respectively, "Remember" and "Don'ts," embody the quintessence of a great amount of most important and practical information. One of the characteristic features of the work is a new method of staining, discovered by Prof. Paquin, which shows the bacilli most distinctly beautiful in pink against a green background. We have never seen the bacillus so clearly displayed by process as is shown by this method, which is not only described but illustrated by three colored plates. It is not too much to say that this little work ought to be in the hands of every physician.

[Books Received.]

The Psychic Life of Micro-Organisms.— By Fred. Binet; translated from the French by Thomas McCormack. The Open Court Publishing Co., Chicago, Ill. Price 75 cts.

The Ethics of Marriage.— By H. S. Pomeroy, M. D., Boston. Funk & Wagnalls, New York, publishers. $1.

Changes in the Red Blood-Corpuscles, in the Pernicious Anæmia of Texas Cattle-Fever.— By Theobald Smith, Ph. B., M. D., Washington, D. C. Reprint from The Transactions of the Association of American Physicians.

Land Liberation as a Public Health Measure.— By George Homan, M. D. Republican Press Ass'n, Railroad Square, Concord, N. H., publishing Co.

Public Health and Municipal Government.— By John S. Billings, M. D., United States Army. The American Academy of Political and Social Science, Phila., Pub. Co.

The Law of Nature.— By Fred. M. Taylor, University of Michigan. American Academy of Political and Social Science, Phila., publishers.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., FEBRUARY, 1892.

MICROBE OF ABSCESS IN LA GRIPPE.

IN two abscesses of a case of *la grippe*,—one which had had all the typical symptoms and had finally presented abscesses here and there on the limbs, notably on one hand,—pus was taken with a sterile hypodermic syringe, examined microscopically, and then inoculated in beef broth. In all the examinations, numerous cocci—presumably of the kind known as micrococcus pyogenes aureus—were found mingled with the pus. Cultures made, revealed no other kind of micro-organisms. It seems that the abscesses were complications, and not due to the micro-organisms of *la grippe* alone. Possibly this organism only weakened the tissue resistance and rendered these fit soil for the pus cocci to develop, for it was impossible to find the bacillus described by Pfeiffer and others as being the germ of *la grippe*.

Pseudo vs. True Gonorrhea.—It is well known that pseudo-gonorrhea is frequently mistaken for the true specific malady of that name; and it is equally well understood, at least theoretically, that in either case the malady is communicable. The Director, a few weeks since, had the opportunity of making some observations from a bacteriological standpoint on these two maladies. (There are, by the way, perhaps more than two kinds; *i. e.*, more than the true specific urethritis and the pseudo-gonorrhea.) In the case presented, a male, there was a discharge from the urethra. It was thick and slight, and had existed but a short time. He appeared a moral man, was clean, and vouched that his life had been pure. He had a wife from whom alone this disease could have been contracted, if from any one. She, he stated, had had a slight thick, creamy discharge for some time and was frequent.

Microscopical analysis revealed an exceedingly pure culture of cocci, in zoöglea. They were not attached to epithelial cells nor to pus corpuscles. The pus cells, in fact, were not so numerous as in gonorrhea proper. The characteristic appearance was the enormous number of these exceedingly fine cocci, mostly all in large swarms. "Diplos" and "tetrads" were absent.

The patient's wife was then called for and examined. She presented a thick, creamy discharge. Microscopically, it presented numerous epithelial cells, few pus cells, and exactly the same fine cocci as were present in the husband's case. The material was a veritable culture of these fine organisms. It is evident that she communicated this pseudo-gonorrhea by her leucorrheal discharge.

Compared with the discharge of a true case of gonorrhea which was presented for treatment at the time, the writer noticed a marked difference in the size and grouping of the microbes,—the organisms of the pseudo-gonorrhea being smaller, by far more numerous, and grouped in numerous characteristic zoöglea, nonadherent to pus cells or tissue cells, as occurs in the true affection.

These preliminary observations may lead us to some important diagnostic points. We are interested now in the comparative results of cultivation and other tests.

The Morphology of the Bacillus of Tuberculosis.—The beginner is often puzzled, and often misled in analyzing sputum from a diagnostic standpoint, because he finds so much difference in the size and appearance of the bacilli of tuberculosis in a given specimen, or in different specimens of the same case, or in specimens of different cases. It is not uncommon to find these organisms so small in appearance that to the eye, with a ⅛ objective say, they appear as mere short hair lines, barely perceptible. With the same stain and under the same power, another specimen may reveal mostly isolated spherical bodies, like fine cocci, which, however, are evidently forms of the bacilli or their spores. At other times, the bacilli appear very large and as positive rods. And again, they appear as fine chains of cocci, here enclosed in a sheath which gives the whole organism the appearance of a bacillus, without any sheath apparent, or only the debris of a

sheath. The Director of this laboratory has sought to explain these differences to his own mind, and has come to the following conclusion:—

That the bacilli of well-developed cases of tuberculosis with large cavities, are usually larger than those of milder cases.

That fresh sputum from mild cases rarely shows beaded chains.

That bacilli in sputum allowed to decompose or become old in vials, say, without desiccation, gradually take a marked beaded appearance, though staining may give them a bacillus shape.

That Heidenreich's idea, that the so-called bacillus of tuberculosis is not a bacillus in the true sense of the word, because of this beaded chain appearance, is not entirely correct, as these spherical bodies are doubtless spheres produced under special circumstances.

The same staining processes are usually more effective in liquefied fresh sputum, in the same length of time, than in old sputum, allowed to putrefy, doubtless because the stain fixes with more difficulty on the spores than the sheath; the former being more numerous and more vital in old sputum than the fresh enveloped forms.

Mouth Antisepsis. — M. Laborde recently stated before the Academy of Medicine, of Paris, that he had for a number of years, excellent success in the prevention of coryza by rinsing the mouth and nasal cavity two or three times a day with a 1–1000 solution of carbolic acid, the solution employed to be as hot as possible.

M. Magitot called attention to the observation of M. Vaillard that in cases in which the saliva was septic in consequence of the presence of streptococcus pyogenes from a small alveolar abscess, the saliva became inert after thorough cleansing of the mouth with antiseptic solutions.

M. Netter found the pneumococcus in the mouth of a patient who had suffered from pneumonia more than a year before; the same observer found the streptococcus pyogenes, the cause of erysipelas and septicæmia, in the mouth of healthy persons.

It is only necessary that there should be a solution of continuity either in the mouth, the respiratory organs, or in the intestinal canal, such as might be produced by an inflammatory disease; as, pharyngitis, bronchitis, or typhoid fever, to give rise to infection of the general system.

It is certainly important that the mouth and nasal cavities should be kept in as nearly an aseptic condition as possible, it being well known that the mouth is the principal door of entrance to the system of the microbes of the air, and furnishes conditions favorable to the development of a large proportion of the germs usually present in the air. Although these microbes seldom find their way into the deeper air passages in consequence of the protecting influence of the ciliated epithelium which carries constantly upward to the mouth a stream of mucus in which the invading microbes are likely to be captured, it is nevertheless true that with the saliva, these organisms are swallowed in great numbers, so that the stomach is continually receiving foreign germs which may include in their number those of a deadly character.

The mouth should be kept in an aseptic condition by thorough washing several times daily, and the use of such an antiseptic as naphthol in a solution of 1–1000 of water, or carbolic acid in equal proportion. If the teeth and all portions of the mouth are kept thoroughly cleansed from fragments of food and foreign matters, the development of those microbes that find entrance to the mouth will be less rapid, and a comparatively aseptic condition of the mouth may be easily maintained. Cavities in the teeth are especially favorable to the development of microbes. The nasal cavity may be kept aseptic by careful cleansing with a solution of common salt in water,—a teaspoonful of salt to a pint of water. The solution may be used with an atomizer giving a strong, coarse spray, or it may be drawn into the nose from a saturated sponge. The use of the salt solution should be followed by a solution of some good antiseptic in a mineral oil. The following is an excellent formula: Pipmenthol, 3½ parts; eucalyptus, 3½ parts; oil wintergreen, 1 part; Alboline, 31 parts.

Peroxide of hydrogen is also an excellent means of cleansing the mouth. Its irritating properties are very slight, so that it may be used in a pure state, if preferred, or one part of the peroxide to one or two parts of water. A tablespoonful of this solution held in the mouth for four or five minutes, will not only destroy the germs which may be present, to a large extent at least, but will also oxidize the minute fragments of dead organic matter which may not have been removed by the toothbrush.

The Bacterium Coli.—There is, perhaps, no single species of the vast family of microbes which is at the present time receiving more earnest, we may say anxious, attention, than the bacterium coli. The fact that this microbe is always present in the body in vast numbers, gives to the suggestions which have been made

respecting the pathological significance of this microbe, an almost unrivaled importance. In a communication upon this subject, made a few days ago to the Society of Biology, of Paris, M. Le Sage states as follows:—

"The researches which I have made with M. Macaigne upon the bacterium coli commune, have led me to the following conclusions: The normal bacterium coli is not pathological for animals when the inoculation is made with a moderate dose, that is to say, a cubic centimeter (¼th dram) of a bouillon culture, a dose which kills animals when the virulent bacterium coli is employed.

"The difference between these results, and those obtained by Escherich appears to be due to the large doses which this author employed.

"Diarrhea, for example the simple diarrhea of infants, renders the bacterium coli virulent, especially in summer diarrhea.

"Cadaveric invasion does not take place with the normal bacterium coli in a subject having neither diarrhea nor intestinal ulceration, within twenty-four hours after death during the winter. In summer, this invasion may be observed. Diarrhea, intestinal ulcerations, and pulmonary lesions favor cadaveric invasion by the bacterium coli, which in these conditions sometimes becomes virulent.

"The normal bacterium coli exists in nearly all stomachs. Whatever may be the chemical conditions of the stomach, the microbe tends to assume the saprophytic form, and is not virulent.

"The microbe found in the pathological manifestations of the bacterium coli in man, is always virulent; that is to say, one cubic centimeter of a bouillon culture will kill a guinea-pig, a rabbit, or a mouse.

"The bacterium coli found in the intestines of children who have died of cholera infantum, or of infectious enteritis, is always virulent. At the autopsies in such cases, cadaveric invasion may always be observed, appearing to be facilitated by the virulence of the microbe; and the bacterium coli found in the invaded tissues is as virulent as those of the intestine.

"The bacterium coli isolated by MM. Gilbert and Girode from many cases of cholera nostras in the adult, possessed great virulence. The same was found to be the case by MM. Chantemesse, Wydal, and Legry.

"In cases of grave diarrhea, bacterium coli is usually found alone in the intestine.

"The pathological bacterium coli has a constant and durable virulence (more than seven months in one case), but of variable intensity.

"The bacterium coli cholerique, as MM. Gilbert and Girode term it, is the most virulent. In successive experiments, it always produced in animals septicæmia, resulting in death in from one to three days.

"The bacterium coli which one finds in an artificially induced suppuration, has less virulence, and always retains its pyogenetic characteristic; for its constant effect in animals is to produce, not a general infection, but abscesses which kill in five or more days, but which may heal.

"The bacterium coli, even when very virulent, may be attenuated and become pyogenetic, but cannot recover its first virulence. The same individual may present septic bacterium coli in the intestine, and the pus-producing bacterium coli in the lung."

Elimination of Microbes by Urine.—This interesting subject has recently been studied by M. Enriquez, who reported to the Society of Biology at its meeting of Jan. 30, 1892, some experiments which he had conducted for the purpose of determining whether or not the elimination of microbes was confined to some particular part of the uriniferous tube. In his experiments, the animal selected for experiment was a cat. Making a section of the cervical portion of the spinal cord, he injected into the veins a culture of different microbes, at the same time making intravenous injections of the same microbes in other cats whose spinal cords were intact. In cats which had undergone section of the spinal cord, secretion was suppressed; in others, where the cord had not been divided, a variable quantity of urine was found in the bladder, and in each case, cultures of the microbe injected were obtained. In three of the five cases in which the cord was divided, the microbes were found in sections of the kidney, and cultures were obtained in all five of the cases. The microbes were found in the cortical and pyramidal substances of the kidney, being always most numerous in the cortical substance.

The author concludes from his experiments, that the elimination of microbes is independent of the aqueous secretion of the urine, a function of the glomerule.

Latency of Diphtheria Germs.—In a discussion which occurred before the French Academy of Medicine, at its meeting of Feb. 2, 1892, M. Vallin called attention to an interesting observation made by MM. Roux and Yersin. These bacteriologists examined the bowels of healthy children who had been placed beside children suffering from diphtheria in a hospital for children, and found almost constantly the pseudo-diphtheritic bacillus, which although

an attenuated bacillus, is nevertheless capable of becoming infectious in certain conditions. According to M. Vallin, similar researches have been made at a school in Normandy situated on the sea-shore in a place where there had been no diphtheria for a long time, and yet the same bacillus was found.

These observations explain very satisfactorily the frequent development of diphtheria where it has not existed for a long time before, and without any apparent cause of new infection. One certainly cannot approve of the experiment of placing a child suffering from some other disease, beside a diphtheritic patient; but the results of this experiment and the others mentioned, show very clearly that the microbes of diphtheria may become attenuated in the mouth, and there retained for an almost indefinite period, in a comparatively harmless form, ready to develop into a most virulent and deadly disease when the conditions happen to become such as to enable the attenuated microbe to recover its virulency.

TECHNIQUE.

Staining Glanders Bacilli.—Dr. Mag-Noniewitcz, in a note translated for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, by Dr. S. E. Weber, veterinarian, Lancaster, Pa., says:—

For the staining of sections of the glanders bacilli, the author recommends the following method, which has given him the best results:—

First, The section is taken out of alcohol, then put in Loeffler's methyl-blue solution (or caust. pot. 1–10,000).

Second, After this it is washed in distilled water and placed in a ½ per cent solution of acetic acid and tropæolin. This mixture is of a Rhine-wine-yellow color. The time necessary for the section to remain in the solution depends upon its thickness. For thin sections, it is sufficient to merely dip them quickly, while thick ones can be left in for two or five seconds, and sometimes longer. In this way the sections may be colored pretty strongly, and the bacilli can be plainly recognized.

Third, The sections must be thoroughly washed in distilled water, or may be immersed in the same; by means of which the acetic acid and tropæolin will be thoroughly removed, and at the same time a pretty large part of the color from the stroma.

Fourth, Spread a section carefully upon the slide, remove the superfluous water with filter paper, and dry the preparation thoroughly in the air or over a spirit lamp.

Fifth, To make the dried preparation transparent, it is treated by dropping on xylol; the longer it lies in this, the plainer become the organisms.

The further microscopic examination can be made in xylol, cedar oil, or Canada balsam. Other oils will remove to a great degree the color from the bacilli.

In this method of coloring the preparations, the stroma will appear more or less bluish, and the bacilli are set forth in a very plain black color. The favorable result of this method is this,—that the preparation, after removal of the color and washing, is not affected by alcohol (absolute after Loeffler or dilute after Una), or removed by strong, uncolored ethereal oil (clove, origanum, anise oil, etc.).

A Test for Carcinoma.—Dr. H. J. Stites, of Edinburgh, recommends the use of a 5 per cent solution of nitric acid (British Pharmacœpia), as a differentiating reagent for tissues suspected of containing carcinomatous portions. During an operation, a portion of the tissue excised is washed thoroughly in water to remove the blood, then placed in the solution for ten minutes. The carcinomatous structure appears dull white, resembling egg albumen, in contrast with the unaffected tissue the appearance of which is translucent and gelatinoid. It is to be hoped that this test will prove reliable. It may be of much utility for diagnostic purposes, and to limit the surgeon in the extent of excision in any given case.

The Preparation of a Thermogenous Substance from Urine.—Put one liter of urine into a large glass; acidulate with phosphoric acid, add 1 c. c. to 2 c. c. of a concentrated solution of chloride of sodium; neutralize with lime water and a little soda lye, until it has the appearance of precipitated flakes. Let the precipitate settle; decant and filter; wash this precipitate in strong alcohol; let it dry, and macerate in 10 to 12 c. c. of glycerine during two or three days, and then filter. If four or five volumes of alcohol are added to the glycerine extract, a flaky precipitate is formed, which, gathered on a filter, redissolves in water. One may inject either the glycerine extract diluted in water, 1 to 5, 1 to 7, or 1 to 10, or the aqueous solution of the flaky precipitate. A short ebullition does not destroy the activity of a thermogenous substance.

This is a method which has been used by M. Paul Binet in his tests with substances extracted from urine of tuberculous persons, and from human beings suffering from other maladies, as well as from sound cases.

BULLETIN OF THE

MEDICAL AND SURGICAL SANITARIUM,

BATTLE CREEK, MICHIGAN.

THE purpose of this department is to constitute, together with the Bulletin of the Laboratory of Hygiene, a record of the scientific work in the Medical and Surgical Sanitarium located at Battle Creek, Michigan, an institution incorporated as an organized and self-supporting charitable enterprise, all the earnings of the institution being devoted to charitable medical work, and the advancement of scientific medicine.

BIENNIAL REPORT OF THE SUPERINTENDENT.

(Continued.)

REPORT OF THE HOSPITAL DEPARTMENT.

THE erection of a surgical hospital in connection with the Battle Creek Sanitarium was made necessary by two important features of the work of this Institution:—

1. The character of the patients who visit this Institution is such as necessarily to include a large number of cases requiring the use of surgical means. The long and successful career of the Institution has created for it a constituency reaching into all parts of the United States, so that its patients come from great distances, and not infrequently from isolated towns where the inaccessibility of first-class medical skill or hospital advantages has led them to neglect their cases until medical and surgical intervention are the only means of relief. It cannot be denied, also, that the conditions of life at the average hospital are usually repugnant to the tastes of refined and cultivated people, who are able to secure more comfortable accommodations. Every hospital is a blessing of untold worth to a community in which it is located, and to the classes for which hospitals are usually intended, viz., the indigent or the victims of accident, to the wants of which they are, for the most part, admirably adapted and well calculated to accomplish the good purposes for which they are intended. But a delicate invalid woman, reared in luxury and accustomed to every comfort and to being carefully protected from every unpleasant sight and sound, can scarcely find, even in a very well regulated public hospital, the conditions likely to prove either congenial or conducive to recovery. The wide recognition of this fact has given rise to a multitude of small institutions, called private hospitals or sanitariums in all parts of the country; in fact, at the present day, almost every leading gynecologist or surgeon has a private institution of his own, which, perhaps for the want of a better name, he calls a "sanitarium," so as to get rid of the opprobrious term "hospital."

It must be admitted that the prejudice against hospitals is enormously exaggerated in the public mind. Even those the least worthy of being presented as models of hospital construction and management can scarcely be considered as furnishing a counterpart of the hospital and hospital life described by Charles Dickens, whose writings should doubtless be held largely responsible for the existing popular prejudice upon this subject. A good private sanitarium must be regarded as a vast improvement over the average hospital, and yet the special advantages offered by these institutions are scarcely such as to entitle them to be called sanitariums, if this term is to be allowed any specific significance as regards the nature of the institution to which it is applied. Few of them are more than comfortable homes furnished with nurses, and, in exceptional cases, facilities for the employment of massage, electricity, and a few of the simpler hygienic methods employed at large and well-organized sanitariums. Nevertheless, the work done in these private sanitariums is far more successful than that of the average hospital, owing to the better care and more agreeable surroundings enjoyed by the patients.

2. Another reason for equipping a hospital in connection with the Sanitarium, was its isolation. Had the Institution been located in the immediate vicinity of some large city, quite possibly the managers would have felt disposed to refer their surgical cases to some neighboring hospital, owing to the large number of non-surgical patients and the press of other medical work. But the great distance to such institutions, and the increasing number of patients requiring surgical aid who a peared among its patrons, gave rise to a d mand which the managers were compelled to meet in providing first-class surgical advantages in connection with the Institution.

3. A third reason which may be mentioned as in the minds of the managers in their plans for the establishment of a surgical hospital, was

the desire to witness the advantages of combining the best advantages for surgical work with equally good advantages for the preparation of the patient for the needed operation, and such after treatment as would secure all the possible advantages of the operation, and restore the patient to his home and friends in the best possible condition.

The managers of the Institution sought, in all their plans for the hospital, and in its erection and furnishing, to supply the very best possible facilities to be attained with our present knowledge of hospital construction and equipment. They endeavored to profit by the experience gained by the Superintendent in visiting the best hospitals in Europe and this country, and spared no pains nor expense in supplying the conditions requisite to complete asepsis in surgical work.

The Hospital furnishes accommodations for 100 patients at the present time, and can accommodate half as many more, as a portion of the building is now used for lecture rooms for the Training School for Nurses, and for the cooking school and the experimental kitchen. The following are a few particulars about the Hospital, which may be of interest:—

It is located on an eminence commanding a wide sweep of picturesque country. The soil is a coarse, porous gravel for about 60 feet, so that drainage is perfect. Extraordinary precautions are taken respecting sewerage, drain and soil pipes, hoppers, etc. The sewer is connected with the large smokestack, and is completely isolated from the building. The air in the sewer-pipe is changed so constantly that there is no chance for the accumulation of sewer-gas.

The ventilation of the Hospital is doubtless superior to that of any similar institution in the country. The fresh air supply is admitted warm to the corridors of each floor, the registers being so placed as to equally distribute the air throughout the corridor. Each room is supplied with its own outlet for impure air, which is placed beneath the window in the outside wall of each room and connected with an independent duct in an inside wall. This plan secures a constant current of air toward the individual rooms, and this prevents the dispersal of odors through the ward. Hospital smells are conspicuous by their absence. The air in the Hospital is at all times as pure and fresh as that out of doors, 10,000 to 15,000 cubic feet of air per hour being admitted for each occupant of the wards. The position and the construction of the Hospital are such as to furnish from nearly every window a delightful outlook, a great advantage to convalescent patients. In the construction of the Hospital great pains were taken by the introduction of non-conducting material into the walls to prevent the inequality of the temperature of rooms, and the disagreeable and sometimes dangerous cold currents which are the result of cold exterior walls.

The Hospital has one of the best operating rooms in the country, furnished with every appliance and accessory provided by modern surgical handicraft. The suite of operating rooms consist of—

1. A preparation room, in which the patient and everything about him, are rendered thoroughly aseptic; then the operator and all assistants, and even visitors, are also required to cleanse their hands in the most thorough manner possible, to lay aside their outer garments and put on aseptic gowns reaching from neck to ankles, before entering the operating room proper.

2. A room adjoining the operating room, opening into it, in which the anæsthetic is administered. In this room, convenient for immediate use, are kept all the medicinal agents useful as restoratives in case of the occurrence of dangerous symptoms from the anæsthetic,—shock, etc., and in addition, galvanic and faradic batteries ready for use, and an apparatus for the administration of oxygen by forced respiration, always charged with a supply.

3. A room also adjoining and opening into the operating room, to which the patient is removed for the application of the dressings and partial recovery from the anæsthetic before being removed to the ward room. In this room is also kept a supply of antiseptic solutions of various sorts, antiseptic dressings, etc.

4. A room for the sterilization of instruments by both steam and heat, and for the distillation and heating of water. By the aid of an automatic apparatus, an ample supply of distilled water, hot and cold, is kept constantly on hand. Contained in an adjacent room, is a larger apparatus for the sterilization of bedding by heat.

Ordinary brooms are not used in the ward, in consequence of their disposition to disperse dust. Carpets are also discarded, the floors being kept in a highly polished state by the frequent application of dressing, so that the amount of atmospheric dust is kept at a minimum. The purity of the air of the operating room is still further increased by means of a large air filter through which the air is drawn by an electric fan. As an evidence of the extraordinary degree of air purity obtained, we may mention the fact that three sterilized potatoes exposed

n the operating room while in use during three hours, gave the following results: No. 1 remained sterile. No. 2 showed only two small colonies, and No. 3 three colonies. The potatoes were so placed in different parts of the room as to give fair evidence respecting the number of air germs present. The result was regarded by Dr. Paquin, Director of the Sanitarium Laboratory of Hygiene, as a very remarkable one. Of course, credit must be given to the fact that the country air with which the Hospital is surrounded is naturally much freer from microbes than the dust-laden atmosphere of a great city. The absence of smoke, city smells, and pavement rattle, is an advantage much appreciated by the patients of this Hospital.

The annexed tabulated statement represents the surgical work done in the Hospital within the two years covered by this report:—

The above record of 674 surgical cases, more than two thirds of which were of a very grave character, is certainly one which is seldom equaled. [Since Oct. 1, 1889, 119 operations, including eighteen ovariotomies, one nephrotomy, and more than fifty other grave operations, have been added to the above list, making a total of nearly 800 operations, the total number of deaths remaining the same.] The small number of deaths in the large number of ovariotomies, which included a very large proportion of bad cases as shown by the detailed history of the cases, and the morbid specimens removed, which are carefully preserved in every case, is considered especially worthy of note. Including three cases operated upon immediately prior to Oct. 1, 1889, there was a succession of fifty-two ovariotomies without a death. A still better record of successive successful cases has since been made, but as the record has not yet been broken by death, its publication is reserved for some future time. The total record of the Hospital in ovariotomy now stands, March, 1892, 150 ovariotomies, with five deaths.

A brief review of the cause of death in each of the cases in which a fatal result occurred will still further emphasize the excellence of the record of recoveries made in this Hospital. The following is a brief statement of the causes of death, the cases being mentioned in the order of their occurrence.

Case 1. The patient was suffering from severe pelvic inflammation and abscess. The abscess had been opened through the vagina and a large amount of pus evacuated. The patient was better for a time, but the fever returned, and other symptoms of pus formation in a point inaccessible from the vagina. An exploratory incision was made. The whole contents of the pelvis were so massed together by exudate that it was found impossible to remove the appendages. No large accumulation of pus was found. The patient's symptoms continued to get worse, and a few days later, her temperature having risen very high, the wound was opened, the abdomen washed out, and an attempt made to remove the numerous foci of inflammation and pus formation, which was fairly well accomplished, but the patient continued to sink in consequence of the systemic poisoning, and died the following day, probably not from the operation more than from the original disease.

Case 2. The patient, a man, was brought to the Hospital unconscious, having fallen in an elevator shaft a distance of forty feet, striking upon the head. At the earnest request of the friends an effort was made to save his life by trephining the skull, which was much depressed at several points. A large part of the brain was found disintegrated, and many large clots in the cranial cavity. The patient continued unconscious and died a few hours after the operation, certainly not from the operation but from the injury.

Case 3. The patient had for years suffered from pelvic inflammation and pelvic abscess; was in a most miserable condition; had been confined to her bed up to within a few days of her visit to the Hospital. On operating, found double pyosalpinx. There were three openings connecting the pus sacs with the intestines. These were carefully closed. The patient left the operating table with a fair prospect of recovery, although the operation had been quite a severe one, owing to extensive adhesions. She died, however, of shock, the night following the operation. The case was evidently a hopeless one without an operation, and the patient's life was constantly threatened by a renewal of the inflammatory attacks, and she was in a most miserable condition.

Case 4. A case of epithelioma of the cervix. Almost the entire cervix uteri was destroyed. The patient was in a very feeble state. The uterus and appendages were removed by vaginal hysterectomy. The patient seemed to have a fair prospect for recovery, but died of peritonitis on the second day. The fatal result in this case may have been attributable to the fact that a violent retching of the patient during the operation caused a knuckle of the small intestine to appear in the wound. The intestine was carefully disinfected and pushed back, but this unfortunate and unpreventable accident may have been the cause of the patient's death.

Case 5. The patient, an elderly woman, suf-

fering from epithelioma of the cervix uteri far advanced, had recently been in a Hospital in Chicago, where operation was declined and the patient sent home. She was brought by friends who with the patient insisted that an operation should be performed if there was the slightest hope of recovery. The operation of partial amputation of the cervix was performed, it being impossible to remove the entire organ, owing to the lateral extension of the disease. The patient died the night following the operation, of shock.

Case 6. In this case, although the patient recovered from the operation, some time later a fecal fistula appeared in the wound, and afterward opened into the bladder. The patient died some months after the operation, from exhaustion. In this case the diseased structures removed were completely imbedded in masses of inflammatory exudate which involved the intestines extensively. The intestines were not torn at the operation, but apparently the intestinal wall broke down subsequently, giving rise to the fistula.

Case 7. The patient had suffered for many years from an abdominal tumor, the character of which had not been fully understood. Had had repeated attacks of pelvic inflammation which had kept her a bedridden invalid for many years. Had been for several months in the Woman's Hospital of New York, in preparation for operation, which was finally declined, the patient being advised to wait until life was unendurable, as the hazard of the operation was likely to be great. It is probable that the tumor was at that time believed to be fibroid in character. The patient was in a most miserable condition, having waited as advised until it seemed impossible to live longer as she was. The condition was found to be cystoma of each ovary with most extensive and firm adhesions everywhere. The adhesions were carefully broken up and the operation completed satisfactorily. The operation was necessarily somewhat prolonged, and the patient was very weak at the close. She died a few hours later of shock.

Case 8. The patient suffered for a number of years from a fibroid tumor of the uterus, which was very large and troublesome, and a source of constant pain. She had been treated for several months by means of electrolysis, but without success, as the tumor continued to grow. The appendages were removed, and the operation completed without unfavorable complication of any sort. Vomiting from the anæsthetic following the operation was exceedingly severe, and continued in spite of everything that could be done for the patient, until her death, on the fifth day following the operation. The cause of death appeared to be exhaustion from severe vomiting. The patient had had similar attacks of vomiting before, from some slight cause, which had nearly ended fatally.

Case 9. The patient, a man aged about 60, had a tumor in the right side below the ribs, and extreme jaundice. Puncture of the tumor with a hypodermic syringe showed it to be a distended gall bladder. The patient was in such a feeble condition that operation was delayed for a day or two, hoping that he would rally. He continued to fail, however, and at the operation two days later it was found that the gall bladder had ruptured. Two quarts of bile were removed from the peritoneal cavity. There was no rise of temperature, and no aggravation of symptoms following the operation. The patient suffered some less pain than before, but died the third day afterward. It is certainly a question whether death was at all hastened by the operation, which consisted simply of an exploration and evacuation of the bile, and washing out of the abdominal cavity. The cause of obstruction of the gall-duct was cancer of the head of the pancreas.

Case 10. A case of double pyosalpinx with extensive adhesions of the appendages. A few days after the operation, decided symptoms of peritonitis appeared. The wound was opened and the abdominal cavity washed out, but the patient died a few hours later.

Case 11. A case in which the ovaries and tubes were imbedded in inflammatory masses. The operation was completed satisfactorily, but the patient died of shock the night following, probably the result of individual idiosyncrasy, as she was of a peculiar nervous temperament, and was greatly depressed before the operation.

Case 12. An enormous fibroid of the uterus, weighing after removal forty pounds, firmly adherent everywhere, enormous veins connecting the tumor with the abdominal walls. There was much hemorrhage at the operation, but the patient left the table in good condition, did well for twenty-four hours, then sank rapidly. After death the abdominal cavity was found filled with serum. The cause of death seemed to be the loss from the blood of such an enormous quantity of serum after the hemorrhage of the previous day. Everything possible was done by compression of the tumor before removal, and by the sub-cutaneous injection of a weak saline solution after the operation.

Case 13. This case was similar to the preceding—a fibroid of the uterus, weighing twenty pounds, with extensive adhesions. The pa-

tient died of shock the night following the operation.

Case 14. An exploratory incision in the case of malignant disease of the uterus, with ascites. The exceedingly friable tissue of the growth was slightly wounded by the blunt trocar used in the evacuation of the fluid, which rendered necessary packing with iodoform gauze. The patient did well for several days. Some days after the removal of the packing, and nearly a week after the operation, the patient began to sink rapidly, and died in a few hours, probably from the recurrence of the hemorrhage.

Case 15. Malignant disease of the rectum, of nearly three years' standing. The operation of excision was performed. The disease extended so high that the peritoneal cavity was involved. The patient did not rally after the operation, and died of shock the next day.

Case 16. Male; exploratory incision with reference to a mass in the right side, of unknown character. It was found to be malignant disease of the omentum, which extended to the anterior wall. The patient had been failing rapidly before the operation, and continued to sink afterward, and died without inflammatory reaction, two days after the operation. He was sinking so rapidly before the operation that he must have died within a few days.

Case 17. In this case the patient died while under anæsthetic undergoing an operation for inguinal hernia. The operation had been completed, and the sutures were being closed when the patient began vomiting. The retching ceased very soon and the patient breathed, but in a somewhat feeble manner. The pulse could not be felt at the wrist. Artificial respiration was employed and normal respiratory movements returned. The pulse also returned to the wrist. The patient again stopped breathing, the pulse disappeared, and although vigorous and long-continued efforts for respiration were made, they were unavailing. Junker's inhaler was employed, and no chloroform was administered after the appearance of warning symptoms. This case is interesting from the fact that the pulse disappeared while voluntary respiratory movements still continued. The amount of chloroform used during the operation was very small, and its administration so gradual and uniform, through the use of Junker's inhaler, that it is difficult to account for the occurrence of death otherwise than by the supposition that the patient had an idiosyncrasy which rendered him unusually susceptible.

It is of interest to note in connection with the above, that in three cases, and perhaps four, the patient died, not from the operation, but from the disease for the relief of which the operation was undertaken, so that justly, but thirteen instead of seventeen cases should be put down as attributable to operation (making the record thirteen deaths instead of seventeen, in nearly 800 cases, or about one and one half per cent).

It is also a consolation to the surgeon to know that in each of the fatal cases with the possible exception of three cases, there was no chance for life without an operation, and in two of those cases the chance for life was a very poor one, and the patient's condition very miserable indeed.

J. H. KELLOGG, M. D.

OPERATION.	Number.	Recovered.	Improved.	Death.	Cause of Death or Failure.
Amputation, fingers	1	1	..	..	
hand	1	1	..	..	
leg	2	2	..	..	
toes	1	1	..	..	
Anal fistula	3	2	1	..	tuberculosis.
Ankylosis of knees, forcible extension	1	..	1	..	
Aspiration of chest	2	2	..	..	
for ascites	1	..	1	..	
Atresia, partial of vagina,	1	1	..	..	
Bubo excised	2	2	..	..	
Calculus of bladder	1	1	..	..	
Canthoplasty	2	2	..	..	
Cervix uteri, amputation of, for cancer	1	..	..	1	Shock, patient being very feeble.
Cicatricial contraction in hand, operation for relief of	1	1	..	..	
Circumcision	2	2	..	..	
Cleft palate	1	1	..	..	
Coccyx, removal of	1	1	..	..	
Cystocele	1	1	..	..	
Cystotomy, perineal for vesical cancer	1	..	1	..	
Epithelioma of ear	1	1	..	..	

OPERATION.	Number.	Recovered.	Improved.	Deaths.	Cause of Death or Failure.
Hemorrhoids	140	140	..	..	
Hernia, inguinal	3	2	..	1	Anæsthetic.
umbilical	1	1	..	..	
Hysterectomy, abdominal	3	1	..	2	Shock.
vaginal	5	2	2	1	Peritonitis.
Inguinal glands removed	1	1	..	..	
Laparotomy, for acute peritonitis	1	..	..	1	Old pelvic abscess.
exploratory incision, malignant disease of uterus	8	7	..	1	Internal hemorrhage.
imbedded cyst	1	1	..	..	
for ruptured gall-bladder	1	..	..	1	Cancer of pancreas.
sutured wound in small intestine	1	1	..	..	
exploratory incision for cancer of omentum (male)	1	..	..	1	Original disease.
Mammary gland, excision for cancer	5	5	..	..	Disease returned in one case.
tumors of	5	5	..	..	
Mole of eyebrow removed	2	2	.	..	
Necrosed metatarsal bone removed	1	1	..	..	
Necrosed humerus, removed	1	1	..	..	
Nephrectomy	1	1	..	..	
Nephrotomy	2	1	1	..	
Ovariotomy	129	124	..	5	1 persistent vomiting, 1 fecal fistula, 1 peritonitis, 2 shock.
Perineum, partial laceration	3	2	..	..	
complete laceration	26	26	1	..	Undiscovered fecal impaction.
Polypus, rectal	2	2	..	..	
uterine	13	13	..	..	
Rectal ulcer	2	2	..	..	
Recto-vaginal fistula	3	2	1	..	
Rectum, excision of for cancer	1	..	..	1	Shock.
stricture of	1	1	..	..	
Round ligaments, shortening of	68	65	3	..	
Strabismus, tenotomy for	2	2	..	..	
Tenotomy of thigh muscles	2	1	1	..	
Testicle, excision of	3	3	..	..	
Trephining frontal sinus for abscess	1	1	..	..	
mastoid abscess	1	1	..	..	
skull	1	..	..	1	Concussion of brain.
Tumor, cystic, of labia	1		..	..	
fatty, of chest	5	5	..	..	
fibroid, of cervix uteri	2	2	..	..	
enlarged lymphatics of the neck removed	1	1	..	..	
tuberculous gland of axilla removed	2	2	..	..	
tuberculous gland of neck removed	1	1	..	..	
urethral	8	8	..	..	
Urethral dilatation for disease of bladder (female)	4	4	..	..	
fistula	1	..	1	..	
Uterus, amputation of cervix	4	3	..	1	
cervix laceration of repaired	37	37	..	..	
curetting	90	90	..	..	
Varicocele	7	7	..	..	
Vesico-vaginal fistula	1	1	..	..	
Minor surgical operations requiring an anæsthetic	42	42	..		
Totals	674	643	14	17	

A NEW METHOD OF OPERATING FOR HEMORRHOIDS.

SINCE the traveling pile doctor demonstrated the possibility of curing hemorrhoids by other means than the ligature, and other remedies in vogue previous to the last dozen years, a great variety of methods of dealing with this little dangerous but troublesome condition, have been proposed. I have investigated all of the proposed methods, and have made a practical trial of most of them, and finally have adopted a method which, so far as I know, is essentially novel, although not wholly new in principle.

This method, which I have employed for the last two years, requires the use of a special instrument which I have termed a hemorrhoid snare, the construction of which is shown in

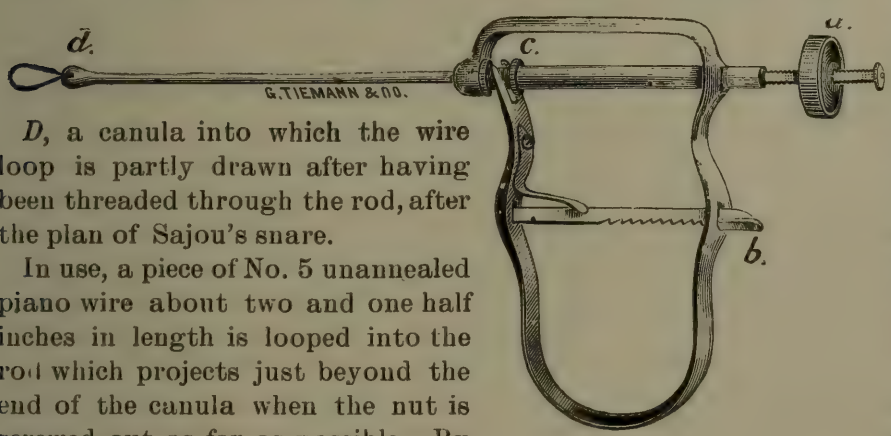
the accompanying cut. The instrument was made for me by Geo. Tiemann & Co., of New York, after designs which I furnished them. It can, of course, be used for other purposes than operation for hemorrhoids, and since it has some novel features, the following brief description may be of interest:—

The instrument consists of the following parts:—

A, a rod with screw thread at one end carrying a nut, and perforated at the other end to receive a loop of wire.

B, a handle of spring steel, one blade of which is free to move when the handle is pressed, the position of the movable blade being retained by a ratchet.

C, an actuating sleeve, one end of which, when in use, rests firmly against the nut, the other end being forced back by the movable handle, thereby forcing back the rod.



D, a canula into which the wire loop is partly drawn after having been threaded through the rod, after the plan of Sajou's snare.

In use, a piece of No. 5 unannealed piano wire about two and one half inches in length is looped into the rod which projects just beyond the end of the canula when the nut is screwed out as far as possible. By a few turns of the nut the rod is drawn in so that the ends of the wire loop are hidden within the canula. The instrument is then ready for use.

The instrument can be made of any size, adapted for an ear, nasal, or throat snare. The rod is easily withdrawn for cleaning purposes. I find the instrument very convenient for any purpose for which a snare is useful.

In the use of the instrument a pair of forceps is put through the loop; with this the hemorrhoid is seized and drawn into the loop, which is at the same time pressed well down around the base of the hemorrhoid. By compression of the handles of the instrument, the loop is drawn into the canula sufficiently to constrict the hemorrhoid. If necessary, one or two extra turns are given to the nut to tighten the loop still further. Dropping the snare, the forceps, still holding the hemorrhoid, are grasped with the left hand, and the hemorrhoid is seared off by means of a small paquelin cautery point or a galvano-cautery knife held in the right hand. Care must be taken that the heat employed is not too great. My custom is to sear the hemorrhoid off at a black or low red heat, and then hold the cautery in contact with the stump long enough to dry it somewhat. As soon as the operation is completed, the ratchet is released, the bar carrying the loop of wire pushed back into the instrument, and all is in readiness for attacking another hemorrhoid.

In the case of large hemorrhoids, I formerly sometimes observed slight searing of the surrounding tissues due to the heat of the cautery, and sometimes the metal speculum would become unpleasantly heated, but this difficulty is entirely obviated, even without the use of an ivory shield, by having an assistant maintain a stream of air upon the field of operation by means of a pair of hand bellows, or preferably a pair of blow-pipe bellows. This not only keeps the tissues cool, but at the same time keeps the field of operation wholly free from the smoke arising from the burned tissues. The operation in ordinary cases is accomplished so quickly that this is entirely unnecessary, but I mention it as a means of enhancing somewhat, in some cases, the comfort of the patient after the operation and the convenience of the surgeon during it.

This mode of operation has the following advantages over most others:—

1. It is extremely expeditious, only as many seconds being required as the old method of ligature required minutes.

2. It is aseptic. Nothing is left behind to decompose and give rise to absorption of septic matters, as is the case when the method of ligature is employed.

3. The results of the operation are under perfect control. Whether the method of ligature or injection of carbolic acid or other liquids, is employed, the resulting inflammation may extend much farther than is desired. I have known several cases in which severe phlebitis resulted, and in some instances worse consequences, from both methods.

4. As dilatation of the sphincter is not required in this method internal hemorrhoids may be removed without the use of chloroform or ether, the operation being practically painless. It is only necessary to inject a small amount of cocaine into the tissues before applying the snare, to render the operation so nearly painless that even a very sensitive patient will undergo it with very little complaint.

5. Suffering after the operation is very much less than after any other method which I have ever tried, and the recovery much more rapid.

6. There is no danger of secondary hemorrhage, as after the use of the galvano-cautery snare, since the cauterization of the stump is very much more thorough than is possible when a heated wire is employed.

Anyone who will make a fair trial of this method will, I am sure, be pleased with it, as it renders the operation much quicker and easier than with any of the clumsy forms of clamps which have been used in connection with the cautery in the removal of hemorrhoids. After using this method in nearly two hundred cases, I would not willingly go back to any of the old methods. I invariably operate with an Allingham's speculum, which I have modified by the addition of a convenient handle, and a fenestrated slide. This instrument was also made for me by Geo. Tieman & Co., of New York.

CLINICAL REPORTS.

Melancholia.—The patient, Mrs. W——, aged 62, referred by her physician, entered the Sanitarium, after having suffered from melancholia for more than a year, the disease gradually advancing until the patient had become quite unmanageable, requiring a constant attendant. She had attempted starvation by refusing all food, and was exceedingly depressed, and at times violent. The course of treatment pursued was absolute rest in bed, and feeding by nutritive enemata of yolk of egg and peptonized beef. After some improvement, the patient beginning to eat, the diet was changed to milk, fruits, and grains, prepared in a variety of ways.

Treatment consisted of massage three or four times weekly, daily sponge baths, applications of faradic electricity every other day, alternate hot and cold sponging of the spine, fomentations over the stomach and liver daily, or every other day, thorough evacuation of the bowels daily by large enemata or colo-clysters, and after the first three weeks, daily exercise in the open air. At the beginning of treatment, the patient had a very foul breath, coated tongue, bowels extremely inactive and prolapsed; the stomach dilated and prolapsed, its lower border lying an inch below the umbilicus.

After five weeks' treatment, the patient was completely restored to mental soundness, cheerful, bright, natural in manner, hopeful, and happy. She had gained ten pounds in weight, had a clean tongue, a good appetite, was active physically, taking considerable exercise daily, and with every prospect of her restoration to health being permanent. The melancholia was evidently due to the disorder of the stomach. Doubtless a large number of cases of melancholia have their beginning in gastric neurasthenia.

Phantom Tumor.—Mrs. Z., aged 44, was sent to the Hospital from a neighboring State for the removal of a tumor in the left side. The patient had an operation several years ago, at which time both ovaries were removed, but for some reason the left fallopian tube was not removed. The physicians who had examined the patient believed the tumor to be due to dilatation of the unremoved tube. On arriving, the patient complained greatly of inability to breathe on account of the pressure of the tumor, and insisted on sitting up in bed the greater part of the night panting for breath. Her attendants thought she suffered greatly from interference of the tumor with respiration. On examination, I found a large hard tumor projecting considerably above the common surface of the abdomen and confined almost wholly to the left side of the abdomen, although extending slightly to the right of the median line. On introducing two fingers into the vagina, passing them up as high as possible, I was surprised to be unable to find any tumor internally, even when making a very firm downward pressure upon the tumor with the other hand. I was still more surprised, a moment later, when the patient had become interested in conversation, to find that the tumor had disappeared altogether, and that no trace of it could be found by either external or internal manipulation. The abdomen was flat and flaccid, and could be pressed to the posterior abdominal wall everywhere. Suddenly the patient recollected herself, and the tumor reappeared exactly as before. Upon calling the patient's attention to the fact that the tumor had disappeared for several minutes, she stated that it often did so, remarking, "It goes up my back, but I can bring it down again," and she did. Further examination convinced me that the tumor was wholly external to the abdominal cavity, and was simply the adipose tissue of the abdominal wall drawn into a rigid mass by voluntary contraction of the muscles. On making the patient stand upon her feet, this fact was still more apparent. A considerable amount of sub-cutaneous fat rendered the lower part of the abdomen very prominent. Grasping the protruding mass, I found it perfectly soft, and evidently unconnected with any internal structure. Then asking the patient to bring the tumor forward, which she did by violent con-

tractions of the diaphragm and abdominal muscles, I could readily feel the mass of adipose tissue harden between my hands, assuming the identical shape of the supposed tumor. These observations taken in connection with other symptoms in the case, showed it to be clearly one of hysteria. After a few days' treatment, including moral discipline, the patient was sent home disabused of the idea which she seemed to have held quite sincerely, that she was suffering from a tumor and needed some operation.

Disastrous Effects from a Mistaken Diagnosis.—Miss ——, aged 34, was sent to the Hospital by her physician for removal of an abdominal tumor. Examination showed the patient to be suffering from a large tumor which filled the whole abdomen. The impression given by palpation was that the tumor was partly solid and partly fluid. It was evidently firmly fixed to the abdominal walls, which showed there had been extensive peritonitis. The patient had been examined by a leading gynecologist and the tumor pronounced to be fibroid of the uterus. Electrolysis had been employed, and peritonitis had occurred shortly after the last application, indicating the electrical application to be the probable origin of the inflammation. The tumor increased with extraordinary rapidity after the occurrence of inflammation, and had continued to develop until the patient's condition was no longer endurable, and although regarding an operation as likely to be fatal in its results, the patient and her friends, as well as her medical adviser, had recommended resort to surgery as a last hope, other means being evidently useless. The operation was begun as an exploratory incision, and with some uncertainty as to the nature of the conditions to be dealt with. On opening the abdomen, the tumor was found to be a multilocular ovarian cyst, and was found to be adherent everywhere; but the adhesions being recent, they were broken down with comparative ease, and the resulting hemorrhage was readily controlled by sponges. The most troublesome part of the operation was the separation of the tumor from the sigmoid flexure of the colon, to which it was very firmly attached, as also to the peritoneum of the right iliac fossa. These adhesions were very firm and vascular, and bleeding was controlled with considerable difficulty. The tumor was safely removed, however, and the patient made an uninterrupted recovery. Dr. Kellogg's system of aseptic drainage was employed. On removal of the drainage-tube on the fourth day, the wound healed by immediate union. The highest temperature after the operation was 100.8° F. This case illustrates the importance of correct diagnosis in connection with the employment of electrolysis by Apostoli's method.

Exudate about the Pedicles Removed by Pelvic Massage.—The patient, Mrs. ——, had been a confirmed invalid for many years as the result of chronic ovaritis, salpingitis, and retroversion of the uterus with adhesions, the result of frequent attacks of pelvic peritonitis. The appendages were removed, and the uterus replaced and secured in position by shortening the round ligaments, both operations being performed at the same time. The appendages were so thoroughly united with the surrounding tissues that the pedicles were somewhat broader than usual, which was, perhaps, in part at least, the cause of inflammatory action in the vicinity of the pedicles a few weeks after the operation, the result of which was quite extensive exudate about the pedicles. The tissues were extremely sensitive, and the patient was unable to walk without pain.

Under the daily employment of massage, combined with vaginal douches and packing the vagina each day with cotton pledgets, the tenderness rapidly lessened, and at the end of three weeks the exudate had disappeared, the patient was free from pain, and returned home in better health than for many years previous.

In another case similar to the preceding—that of Mrs. C.——, in which the removal of the diseased appendages required very extensive denudation of the adjacent tissues, although there was not very pronounced evidence of inflammatory action after the operation, a few weeks subsequent a mass of exudate was found at the point from which the left appendage was torn. The exudate disappeared entirely as the result of three or four weeks' treatment, which was essentially the same in character as that described above.

Another patient, Mrs. ——, had suffered for years from the results of acute pelvic inflammation, which had left behind extensive exudate in the region of both broad ligaments. As the result of pelvic massage administered for ten minutes daily, the exudate almost entirely disappeared, and the uterus and other structures became very much more movable, the pain and tenderness disappearing.

Pelvic Hematocele and Phlebitis of Right Limb.—The patient, aged 42, suffering from a large uterine myoma, entered the Sanitarium early in December, with a morning temperature of 101° F., and an evening temperature of 103° F. She had had several chills, and extreme pain in the lower abdomen some days before, since which time the fever had continued with exacerbations. There was also

great swelling of the right leg from phlebitis. The pain was constant and severe. The treatment employed was fomentation of the lower abdomen and leg two or three times daily and packing of the leg in moist cotton, covered with large masses of dry cotton so as to maintain a constant temperature. The hot vaginal douche was taken twice daily. At the end of three weeks, the patient's temperature was normal, the œdema and tenderness of the leg had disappeared, and the patient was convalescent.

Nervous Headache.—Mrs. S., aged 46 years, a delicate little woman, married, the mother of several children, had suffered for five years from very severe nervous headache. The attacks of migraine were sometimes so severe as to occasion muscular spasms, and recurred every few days. From month to month the paroxysms became more frequent and severe.

The treatment in this case consisted of a milk, fruit, and grain diet; the application of massage, light, baths, tonic applications of electricity, and revulsive applications to the spine. After three weeks the nervous paroxysms disappeared entirely, the patient gained rapidly in strength, and at the end of ten weeks returned home well.

Chronic Malarial Poisoning Cured without Quinine.—Mrs. S., aged 55, had been suffering for several weeks from malarial fever. The chills had recurred every other day for 42 days, notwithstanding quinine had been used in the largest admissible doses. Her temperature remained above normal all the time, the usual morning temperature being 100° F., and the evening temperature 103.5° F. Urinary analyses showed albumen present to the extent of one third the bulk of each specimen tested, after allowing the test tube to stand for several hours. As the quinia had done no good, and also considering the condition of the kidney, its administration was discontinued. The patient was made to drink hot water freely, and by means of hot packs, fomentations over liver, stomach, and bowels, free activity of the skin was encouraged. Each day an effort was made to anticipate the chill by wrapping the patient in warm blankets and placing rubber hot water bottles about her. By this means the periodicity of the chills was broken up, although they still occurred irregularly, and the albumen was diminished to one twelfth the bulk of the urine. After a few weeks of this treatment, 20 grains of quinia per diem were administered on two alternate days, but with no effect whatever upon the chill or the fever, and the albumen was increased to one third. The eliminative treatment was again resumed and employed more vigorously, the patient being kept in a state of mild perspiration constantly for nearly two weeks. Under this treatment, only one slight chill occurred, and the albumen was reduced to a mere trace. The temperature has now been normal for several weeks, the patient eats and sleeps well, is gaining in strength, and instead of being confined to her bed, goes about quite freely, the only impediment to locomotion being a soreness of the legs due to thrombosis involving successively both femoral veins, which occurred as a complication early in the history of the case. The swelling has nearly disappeared from the limbs and they are rapidly gaining strength under daily local applications of electricity and massage.

RECORD OF SURGICAL WORK IN THE SANITARIUM HOSPITAL FOR JANUARY, 1892.

The Surgical Staff of the Hospital are as follows:—

J. H. Kellogg, M. D., Surgeon-in-Chief.

H. M. Dunlap, M. D., ophthalmologist and aurist.

Kate Lindsay, M. D., gynecologist.

Surgical Assistants: A. J. Hoenes, M. D.; Addie J. Johnson, M. D.; Lillie B. Wood, M. D.; Ruth Bryant, M. D.; Mrs. S. M. Baker, matron of surgical ward.

The regular operating days in the Hospital are Mondays and Thursdays; but the pressure of urgent cases frequently requires operations on other days.

Owing to the prevalence of *la grippe*, from which one of the Hospital surgeons suffered severely, as well as a number of the nurses, no operations were performed in the Hospital during the first part of the month of January.

The following report of operations performed during the month of January, is from the records kept by Dr. A. J. Johnson, the House Physician of the Hospital:—

January 13.

Cystic Tumor of Labium.—Patient aged 38, sent by Dr.——. Large and painful cyst in left labium, caused by obstruction of the duct of Bartholin's gland; had been incised several times without benefit; removed both cyst and gland; immediate union.

Epithelioma of Cervix Uteri.—Patient aged 52; sent by Dr. Martin. The disease involved the fundus uteri and had extended into the left broad ligament, rendering complete removal impossible; removed as much of the diseased tissues as possible with curette and scissors, and applied chromic acid. No febrile reaction fol-

lowed the operation, and the patient returned home in a few days.

JANUARY 14.

Trachelorrhaphy.—Two cases. The first patient aged 31. Had suffered for years from menorrhagia. Bi-lateral laceration, requiring two sutures on one side, three on the other. Antiseptic dressing. Recovery complete, without febrile reaction. The second case, aged 30 years, sent by Dr. Graybill. Double laceration of cervix, with vegetations of endometrium. The curette removed a great quantity of fungoid growths. Cervix repaired by sutures, two on one side, four on the other. Excellent recovery.

Fatty Tumor of Mammæ.—Patient aged 30. Sent by Dr.——. Had suffered for a number of years from painful tumor of left breast; removed with cocaine. Wound closed with deep sutures. Immediate union.

JANUARY 17.

Removal of the Coccyx for Coccygodynia.—Mrs. B., aged about 30, had been examined and treated by an "orificial" surgeon, for "pockets and papillæ," and also for "rectal ulcer," but was not materially benefited, and still supposed herself to be suffering from the rectal ulcer, as she had thus been informed by an "orificialist." On examination, found the rectum slightly congested, but no evidence of ulcer, and no pockets or papillæ, except such as nature has provided to every human being for a useful purpose. The coccyx was found curved in to an unnatural degree, and great tension and tenderness of the structures connected with it. As electrical and other applications gave the patient no relief, the coccyx was removed, with the result that the patient was relieved from her distress, and the "rectal ulcer" healed without any operation upon the rectum.

JANUARY 18.

Varicocele.—Patient aged 24. Had suffered from painful varicocele for 14 years. Excision of a portion of the diseased veins. Recovery without febrile reaction.

JANUARY 19.

Ovariotomy.—Patient aged 24. Had scarlet fever when young. Always suffered from extreme menorrhagia, bearing down; continued suffering from which no treatment gave relief. Removed appendages. Right ovary cirrhotic, cystic, and contained small hœmatocele. Left ovary a shriveled mass of cirrhotic tissue. Good recovery.

JANUARY 20.

Ovariotomy.—Patient aged 65. The patient believed a tumor to have existed nearly 20 years; had recently been growing rapidly, and was painful. Incision 3½ inches. Removed multilocular cyst weighing 9 lbs. Time of operation 15 minutes. Good recovery without febrile reaction.

Complete Laceration of Perineum.—Patient aged 40. Laceration occurred nine years before at birth of hydrocephalic child. Entered a hospital two years ago, and had an operation performed for restoration of perineum, but the operation, unfortunately, was unsuccessful. Perineum entirely destroyed, and septum divided to the extent of two inches. Operated by a modification of Tait's method. Result perfect; the patient has complete control of both fluid fœces and flatus.

JANUARY 24.

Ovariotomy.—Patient aged 31. Incision two and one half inches. Removed cyst of broad ligament weighing ten pounds. Left ovary cystic and cirrhotic, also removed. Good recovery.

Curetting—Trachelorrhaphy-Shortening of Round Ligaments.—Patient aged 18; bad laceration of cervix. Profuse menorrhagia. Complete retroversion following child-birth. After curettage, the cervix was repaired, and a pessary placed, after which the round ligaments were shortened. The curettage and trachelorrhaphy were completed in thirteen minutes. The operation of shortening the ligaments occupied fifteen minutes. Good recovery.

JANUARY 25.

Ovariotomy.—Patient aged 19. Sent by Dr. Avery. Incision three inches; multilocular cyst of right ovary. Deep sutures. Left ovary also diseased. The patient was very weak before operation, having had continuous fever for many weeks. Good recovery. Temperature became lower immediately after operation and soon became normal.

Ovariotomy, and Shortening Round Ligaments.—The patient had suffered for years from retroversion and severe pelvic pain; tender mass in left ovarian region. Uterus firm; bound by adhesion. Found ligaments and drew them partly out. Median incision two and one half inches; broke up adhesion of uterus; removed the appendages; found cystoma of right ovary; both ovaries cirrhotic, adherent, and tubes occluded. Recovery good.

Shortening Round Ligaments.—Patient aged 33. Had suffered for years from retroversion and ovarian pain; uterus fixed by adhesions. Broke up adhesions by conjoined manipulations. Shortened ligaments by Dr. Kellogg's method. Recovery excellent.

JANUARY 26.

Ovariotomy.—Patient aged 63. Well until within a few weeks. Abdomen began to enlarge three weeks before; greatly distended with fluid. Suspected malignant disease; exploratory incision revealed ovarian fibroid on left side as large as the fist; a similar tumor half as large on the right side. Removed both appendages; washed out cavity. Patient made a good recovery. Ascites did not return.

Ovariotomy.—Patient aged 34. Sent by Dr. Greene. Chronic intractable disease of appendages; incision two inches. Right ovary cystic, cirrhotic; left ovary cystic, cirrhotic, contained hæmatocele. Extensive adhesions on both sides. Time of operation sixteen minutes. Patient made a good recovery and returned home, well.

Crushed Hand.—Boy aged 7. First phalanx of thumb, index, and middle fingers, terminal phalanx of third finger ground to shreds. The principal arteries of the thumb not being destroyed, the fragments were brought together, the terminal phalanx of the third finger treated likewise. The first and second fingers were amputated. The parts were washed thoroughly in a hot solution of bi-chloride, 1–2000. Healing was rapid and without suppuration.

JANUARY 27.

Curettage of Uterus and Trachelorrhaphy.—Patient aged 44. Uterus large; retroverted; extensive menorrhagia; laceration of cervix. Removed a large quantity of vegetations, and repaired cervix in the usual manner. Recovery without febrile reaction.

Partial Atresia of Vagina.—Patient aged 17. Remarkably well developed in other respects, but presented one inch within the introitus vaginæ, a firm circular band scarcely large enough to admit the tip of the little finger. Had never had any injury; had never suffered from any local disease; hymen perfect. Dilated the constriction with rectal dilator. Packed vagina with iodoform gauze. No febrile reaction.

Shortening Ligaments.—Patient aged 26. Had suffered from introversion for many years; not benefited by pessaries on account of tender ovaries; confirmed invalid. Shortened ligaments three and one half inches each; operation completed in sixteen minutes. Good recovery.

Ovariotomy.—Patient aged 43. Sent by Dr. Malone. Had tender mass in region of right ovary, also in left ovarian region, a tender mass; had been advised by a consulting physician that an operation would probably be fatal. Patient very fleshy; four inch incision required. Found large left hydro-salpinx closely adherent to the intestines and surrounding tissues by old adhesions; removal extremely difficult; right ovary buried in a mass of inflammatory exudate and adhesions; had to dig it out. It was necessary to remove the intestines from the abdominal cavity during the operation. They were carefully wrapped in hot towels and returned in good order. Good recovery.

JANUARY 28.

Curettage for Metrorrhagia.—Patient aged 19. Uncontrollable metrorrhagia for several weeks; great quantity of vegetations removed; uterus irrigated with hot bi-chloride solution; hemorrhage ceased at once. Excellent recovery.

Shortened Round Ligaments—Curettage.—Patient aged 27; retroversion for several years; profuse menorrhagia; shortened ligaments four inches. Good recovery.

JANUARY 31.

Curettage—Adhesions Broken Up.—Patient aged 49. Retroversion for many years, causing great mental depression; uterus adherent; menorrhagia; broke up adhesions by conjoined manipulation; removed vegetations by curettage, and placed pessary. Recovery without febrile reaction. Patient greatly improved.

Perineorrhaphy.—Patient aged 38. Laceration had begun eight years previous; not quite complete; bad rectocele; operation by Tait's method. Time, eight minutes. Good recovery.

Total number of operations during the half month covered by the report, twenty-five, of which eight were ovariotomies. All made good and speedy recoveries.

How to Increase the Hæmoglobin of the Blood.—M. Zuntz, of Berlin, has called attention to some experimental researches which indicate that the only means necessary for increasing the amount of hæmoglobin in the blood, is to increase the proportion of albuminoid elements in food. This may be done, either by increasing the amount of flesh food, eggs, and milk, or better still, in many cases, by keeping the patient upon a diet consisting largely of milk and whole grain preparations, such as oatmeal, Graham grits, cracked wheat, etc., and especially the leguminous seeds, peas, beans, and lentils. It must not be forgotten, however, that carbo-hydrates and hydro-carbons are necessary, as well as albuminous elements.

How Oxygen is Used in the Body.—M. Leyden, of Berlin, has determined, experimentally, that of the oxygen taken into the body through respiration, the heart uses from 3.3 to 10 per cent, the muscles of respiration 10 per cent, and the digestive apparatus from 20 to 25 per cent.



[See Bulletin Laboratory of Hygiene.]

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BACTERIOLOGICAL WORLD

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ORIGINAL ARTICLES.

THE ATTENUATION OF VIRULENT MICRO-ORGANISMS.

BY PROF. F. G. NOVY, M. D.
Ann Arbor, Mich.

ONE of the most fruitful paths into which the science of bacteriology has been directed in recent years is that leading to the study of the physiological variations which pure cultures of well-known and acknowledged pathogenic micro-organisms undergo under certain peculiar, or rather, abnormal conditions. The remarkable discovery which paved the way into this unknown and mysterious field was made by Pasteur in 1880, who found that cultures of the germ of chicken cholera, when exposed to air for a long period, lost their virulence, in other words, became attenuated; and that such attenuated cultures, when inoculated into a susceptible animal, rendered it immune against inoculation with the most virulent material. The next step taken by Pasteur was to apply a similar method of attenuation to the bacillus of anthrax, and the same result was obtained. He demonstrated that the bacillus of anthrax, when cultivated for many days at a temperature slightly above the normal, lost its virulence to such a degree that it no longer produced fatal results on inoculation into animals. The culture obtained by growing the bacillus at a temperature of 42°–43° for a period of 24 days, and known as the *premièr vaccin*, was no longer fatal to the experimental animals, but did not protect them against the virulent germ. Such protection, however, was obtained when subsequent to an injection of the premièr vaccin, another injection was made with a culture (the *deuxième vaccin*) grown at the same temperature as above, but only for a period of twelve days.

But even before Pasteur, immunity had been obtained in animals by Toussant, by inoculating them with anthrax blood which previously was either heated to 55° for ten minutes, or mixed with a one-per-cent solution of carbolic acid. Chamberland and Roux (*Comptes Rendus* 1880) found that carbolic acid in the proportion of 1–600 effected complete attenuation in twenty-four days at a temperature of 35°.

In 1884 Chauveau observed that when the anthrax bacillus was grown under a pressure of 7–9 atmospheres of oxygen for 7–8 generations, its virulence was diminished to such an extent that it no longer was fatal to sheep and cattle, though still dangerous to guinea-pigs. In 1889 he extended his observations on the action of oxygen, and showed that these cultures, with decreased pathogenic properties, when submitted to the further action of oxygen, under pressure, could be brought to a point where complete loss of virulence occurs, so that the cultures were no longer fatal to even the most susceptible animals, as mice, rabbits, and guinea-pigs. And what is still more remarkable is the fact that these cultures, with apparently their virulence totally lost, are still capable of producing immunity in animals, that is to say, their vaccinal properties are preserved although their virulent properties have apparently entirely disappeared.

From the facts thus presented it will be seen that there are various conditions which may effect an attenuation of the anthrax bacillus, and accordingly, we find almost as many explanations offered. Pasteur formerly held that oxygen was the chief element involved. Koch and his pupils on the other hand have attributed the attenuating influence as due solely to increased temperature.

There can be no question as to the influence exerted by an abnormally light temperature, but to assert that oxygen under ordinary atmospheric conditions is without influence, is unwarranted. From Chauveau's experiments we know that oxygen under pressure is a very sure and effective agent for accomplishing this end, and there can therefore be no doubt but that oxygen under normal conditions will exert this same influence though to a less degree. For that reason it is now held by the French school that the attenuating causes are to be sought for in the action of oxygen at an abnormal temperature.

But there are undoubtedly other conditions which at times come into play and exert a marked tendency to accomplish the same result. We have had frequent occasion to observe that anthrax cultures which, when first inoculated into agar tubes, were highly virulent to white rats, when kept at the ordinary temperature for several months had no effect on these animals, whether young or old.

The cultures which had thus lost their virulence with respect to the white rat, possessed undiminished virulence so far as the rabbit and guinea-pig were concerned, and all that was necessary to bring them back to their original high virulence was to pass them through one of these animals.

This initial loss of virulence may be explained in several ways. Thus, the oxygen of the air, acting over a long period of time, may be the attenuating agent; or, the waste products which, generated by the growth of the germ, impregnate the soil upon which it grows, and by virtue of their noxious properties exert an attenuating influence; or, it may be due to diffuse sunlight.

It may be said that this condition is brought about only when the bacillus is in a vegetative condition, and before spore formation has resulted. This, however, is not true; for we have repeatedly observed that the same initial loss of virulence was obtained when the micro-organism was left in the spore condition for a long time, at least several months, on agar.

The investigations of recent years have shown that bacteria yield waste products, or products of tissue-change, which may exercise a very marked effect upon the growth of the organism which produces them. Thus, in lactic acid fermentation the activity of the bacillus inducing it is gradually lessened in proportion as the quantity of acid is formed; and when this amount reaches .075–.08 per cent, the growth entirely ceases; and if allowed to act beyond this point, death of the micro-organism results. The same is true in butyric acid, or in urea fermentation, and has always been recognized in alcoholic fermentation induced by the yeast, where the process ceases when the amount of alcohol formed reaches about fifteen per cent. Again, a very large number of the common forms of bacteria produce carbolic acid and derived compounds, and it is easily conceivable how the accumulation of these products may exert decided germicidal properties. That the infectious micro-organisms produce highly poisonous compounds which may be alkaloidal or proteid in nature, is well recognized.

Toussaint's experiment, already referred to, showed that carbolic acid, in the proportion of 1–100, acts as an attenuating agent, and it is reasonable to suppose that a like action will be exerted by similar toxic products generated by other germs. From the work of Chauveau we know that compressed oxygen, a powerful attenuating agent, is without effect upon the ready formed spore, exerting its specific action only on the vegetative cell. It is therefore improbable that the oxygen of the air, under ordinary atmospheric pressure, should exert any attenuating influence upon the spores in an agar tube.

The action of light as an attenuating agent must not be lost sight of. Diffuse sunlight appears to exert no special influence, but with direct sunlight it is quite different. The experiments of Duclaux and Arloing show that anthrax spores are killed in a few hours by an exposure to the direct rays of the sun, and that before destruction takes place they pass through a stage of attenuation.

The most plausible explanation that can be offered, then, is that this initial attenuation is brought about by a prolonged exposure to the injurious action of the metabolic products of the cells proper. In this same way is to be explained the so-called *natural attenuation* which certain infectious micro-organisms undergo when transferred from their usual habitat, the animal body, to the ordinary artificial culture media. Not only are the condi-

tions of their growth different, but they are constantly being exposed to the action of their own waste products, which, as we have seen, are capable of exerting marked deleterious action upon the protoplasm of the cell.

Artificial attenuation, on the other hand, can be brought about by a variety of factors, most of which have already been spoken of. These are exposure to abnormally high temperatures, to compressed oxygen, to direct sunlight, to the action of chemicals (including metabolic products). Under the latter class are all the experiments of Toussaint with carbolic acid, and Chamberland and Roux with carbolic acid and bichromate of potash. We have made a series on the action of carbolic acid and mercuric chloride on the anthrax bacillus, and have not only succeeded in attenuating the bacillus, but also in producing immunity in animals with such cultures. The results of this work, carried on in conjunction with one of my students, Mr. Geo. F. Sucher, will be reserved for another paper.

The attenuation of infectious micro-organisms is a fact which can be demonstrated or brought about in a number of ways. The explanation of this fact, however, is quite obscure at present, but its solution unquestionably lies in the study of the chemical products of the virulent and attenuated forms. Morphologically there is little or no difference in these two conditions; and, if there is an alteration in the cell protoplasm itself or in its physiological function, this will be evidenced by an altered cell metabolism. This field has already been approached by Behring, who has shown that the virulent anthrax bacillus yields more acids than does the attenuated form, but the latter, on the other hand, possesses a greater reducing power. In further accordance with this view are the observations of Brieger and Frænkel that the non-virulent Loeffler's diphtheria bacillus yields a non-poisonous albumin, while the virulent micro-organism produces a highly poisonous toxalbumin.

The following represents the composition of leukæmic blood, according to the analyses of Freund and Abermayer: Water, 895.8; solids, 104.2; albumin and hæmetin, 72.0 (hæmoglobin, 35.0); peptone, 12.3; fats, 7.1; lecithin, 3.8; cholesterin, 2.1; salts, 9.8.

T. Araki has studied the formation of lactic acid and glucose in the organism, and the results obtained can be briefly summarized.

1. Well-fed dogs, rabbits, and chickens, kept in an atmosphere in which the oxygen contents had considerably decreased, secreted urine containing lactic acid, glucose, and albumin. This is undoubtedly due to deficient oxidation in the organs, and so also are the following results to be explained.

2. If the animals were in a condition of starvation and then subjected to the same experiment, lactic acid and albumin, but no glucose, could be detected in the urine.

3. Exposure to carbonic oxide produced the same results as under No. 1 in well-fed animals; and as under No. 2, if previously in state of starvation.

4. Intoxication with curara, keeping up artificial respiration, developed sugar and lactic acid in the blood in dogs and frogs.

5. In strychnine poisoning of frogs, glucose and lactic acid appeared in the urine.

6. The urine of epilepsy (3 cases) contained albumen and lactic acid, but no sugar. (*Zeitschr. f. Physiol. Chem. 15, 335.*)

THE INFLUENCE OF DRESS IN PRODUCING THE PHYSICAL DECADENCE OF AMERICAN WOMEN.

BY J. H. KELLOGG, M. D., BATTLE CREEK.

(Concluded.)

THE practical bearings of this question are too evident to require more than mention.

1. It is evident that pelvic disease involving the displacement of organs is only a part of a general disorder in which every organ below the diaphragm may be involved, and any system of treatment which addresses itself exclusively to the disorders found present in the pelvis, must be unsuccessful. Here is to be found the secret of the failure of so many methods and systems which have been proposed for the relief or cure of pelvic disease, particularly displacements. I do not hesitate to make the assertion that any method of treatment, either medical

or surgical, which does not address itself to the removal of the causes of the disorder as well as to its effects and amelioration of symptoms, must result in failure. Temporary relief, often apparent cure, may be effected, but sooner or later the patient will find himself in the same wretched condition as before. This explains the almost universal failure of pessaries, local application of electricity, operations upon the perineum, and the various forms of anterior and posterior colporrhaphy, operations for shortening the round ligaments, ventro-fixation of the fundus, and a great variety of other methods and procedures which have been adopted for the relief of the various forms of displacements of the pelvic organs. The pessary sometimes succeeds, provided there is some coincident change in the habits of the patient which increases the strength of the muscles of the waist and abdomen. But in my estimation nothing can be more absurd than to thrust a pessary up among a mass of prolapsed abdominal and pelvic viscera, stretched away from their normal moorings, jostling one another about in the abdominal cavity, swaying in whatever direction the body happens to incline. No wonder that such patients often complain that the pessary gives pain. Certainly it is no marvel that ulceration, ovarian irritation and inflammation, and even salpingitis, are not uncommon results.

Thirty years ago, Banning undertook to effect a cure of pelvic disorders by means of braces which supported the trunk in a natural position. The weak point in this system was its inability to give strength to the weakened muscles. An external skeleton consisting of an iron frame-work is no more efficient in developing the muscles of the trunk than one composed of hickory or whalebone stays. The "Neptune's girdle," or "*umschlag*" of the old German water cures, not infrequently perfected cures by allaying local congestions, irritation of the abdominal sympathetic ganglia, and especially by supporting the relaxed abdominal walls, and holding up in position the prolapsed viscera. Patients are sometimes cured by being sent on long journeys abroad, in which they gain muscular strength and vigor by mountain-climbing, horseback-riding, and the active exercise necessarily involved in sight-seeing.

Cures have been effected by each of these and other haphazard methods of treatment, but they were accidental, and not due to scientific methods, and patients were not infrequently made worse. I have known of cases in which young women were injured for life by being advised by their physicians to exercise in a gymnasium, without the same careful prescription as to the kind and amount of exercise to be taken as a judicious physician would give respecting the administration of a powerful drug.

2. It must be evident that a large share of the symptoms present in cases belonging to the class which is generally referred to the gynecologist, are really due to disorders of other organs, which are involved in the general disturbance, or as the French call it, *desequilibration*, of the viscera of the lower half of the trunk.

Most women suffering from pelvic diseases complain of pain when on the feet, dragging pain in the bowels and the lower portion of the back, pain at the extreme lower end of the spine, soreness and pain in the region of the navel, a feeling of lack of support in the lower abdomen, a sensation commonly described as goneness at the pit of the stomach, weakness of the lower limbs, pain in the back, crawling, tingling, numbness, stinging, and other sensations in the legs, cold hands and feet, burning of the soles and palms. Sometimes the patient says she is only comfortable, when on her feet, when holding up the bowels with the hands. Such patients tenaciously cling to the corset, because they evidently need some support. These patients also often complain that when they undertake to stand without a corset, there is such a sinking at the stomach that they are compelled to sit down. The evident cause is the dragging of the prolapsed bowels and stomach, occasioned by the relaxation of the abdominal muscles by which the branches of the pneumogastric and sympathetic nerves are put under an unnatural strain. It is evident that in these cases a large part of the symptoms are due, not to the pelvic disorder, but to the general disease of which this is a part.

If we expect to cure a woman who is a chronic sufferer from pelvic disorders, we must treat the patient rather than the malady. This is a principle which applies, in fact, to most chronic disorders; and a failure to recognize this principle is the rock upon which professional effort often splits. It is as hopeless to undertake to cure such maladies by the usual routine methods, which are addressed to local symptoms and conditions only, as

to expect to kill a noxious weed by picking off its flowers or a few of its leaves. The whole disease must be eradicated, root and branch. This can only be accomplished by the removal of all the morbid conditions which are the real causes of the multitudinous symptoms by which the disorder is recognized, and for which it is often named. Rational treatment of this class of diseases must, then, include, first of all, the adoption of a proper dress, which will be one in which every muscle of the trunk will have perfect freedom to act. The patient must be instructed to have her dress measure taken with the waist fully expanded, and to allow an inch or two for growth, in the hope that to some degree she may overcome the deformed condition which she has induced by ignorant obedience to fashion, rather than to the laws of physiology and the dictates of common sense.

Health corsets are a device of the devil to keep women in bondage who are seeking for deliverance from the weakness and misery from which a really healthful mode of dress might emancipate her. Shoulder-braces and harness of every description are, on the whole, a snare and a delusion. The only correct principle is to suspend everything from the shoulders by means of waists which will equally distribute the weight upon natural bearings, and at the same time give latitude for the greatest freedom of waist movement.

If all women would at once adopt a healthful mode of dress, probably half of our profession would be obliged to seek some other calling. Certainly, at the present time, more than half our business consists in efforts to repair damages which ignorant women have inflicted upon themselves. Neither a proper knowledge of the requirements of the body, nor a just consideration of the principles of beauty, justifies the popular mode of dress. The idea that a small waist or a round waist is beautiful, is a mischievous and dangerous notion, which ought to be eradicated from the public mind. Nature never made a waist round, slight, or tapering, as though it were chiseled out of a block of wood, and why should we allow ourselves to be persuaded by the fashion-mongers that a thing which from an artistic standpoint is truly hideous, is otherwise than monstrous and repulsive? An artist who would make a nude figure with the waist molded after a French corset, would not be allowed to exhibit his work in any respectable gallery.

A singular illustration of the inconsistency of human nature is to be found in the fact that the same artist who takes so great care of his "model's" figure that he will not allow her to wear a corset, or subject herself to waist constriction of any sort, never thinks to criticise his wife, who squeezes herself into a French mold of the latest pattern, regardless of the fact that the circumference of her trunk is decreased by several inches at the middle, only at the expense of a commensurate increase below the waist, making an unsightly protuberance of displaced adipose tissue, relaxed abdominal muscles, and a promiscuous assemblage of stomach, bowels, kidney, spleen, and other things, which have been forcibly ejected from the snug corners in which nature carefully stowed them away, and thrust into an unnatural and unsightly mass below. We see in the enormous busts and bustles which fashion prescribes, an evident attempt to cover up the uncouthness of form which the corset and other fashionable modes of torture have induced, by means of these excrescences, and by their aid to approach as far as possible to the ideal figure, which, in its native grace and beauty, requires no such accessories.

LONDON MEDICAL NEWS.

BY W. B. JONES.

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[SPECIAL CORRESPONDENT.]

Hysterectomy.— Dr. Champnèys of St. Bartholomew's Hospital, recently performed a vaginal by sterectomy for malignant disease of the uterus. After removing the diseased parts, the two layers of the peritoneum were allowed to fall together, the vagina being packed with sublimate gauze. The patient (a woman of about 58) made a rapid recovery, the temperature not going above 99.2° F. Mr. Harrison Cripps and Dr. Champneys also removed by abdominal section a uterine fibroid weighing 12 lbs. The stump was secured extra-peritoneally by the serve-hand, and the patient made a good recovery.

Dr. Berry Hart, Edinburgh, reports a case of vaginal hysterectomy for carcinoma cervices in early pregnancy. The patient was aged 33, and 3 months before admission had flooding at her period with a discharge for 2 months after. The cervin was found to be enlarged and fun-

gating, the parametruin was quite free, the uterus was enlarged. The uterus was removed, and the patient made a good recovery.

La Grippe and Dengue.— Dr. Robert W. Felkin, Edinburgh, considers that influenza is the self-same disease as dengue, such as he has witnessed in Africa. In dengue, an attack may last from one and a half to three or four days, when there may be a remission of symptoms, the remission lasting two to four days, when, if the patient be not carefully treated, a second paroxysm occurs. The first rash occurs on the first to the fifth day, and a second may appear on the sixth to the seventh day of the disease. It may be red, smooth, and continuous, as in scarlet fever, or rough and dark, as in measles. There may be pain in the testicle with hydrocele. Also in the female, uterine hemorrhage and miscarriage may occur.

In a recent case under Dr. Felkin's care, a lady, who was in the eighth month of pregnancy, was ill five days with influenza. She became red as a lobster and lost a good deal of blood. Dr. Felkin was called, and found the membrane ruptured, and delivered her at once. Two days afterward, she had a second rash, which was popular, with a temperature of 103°–8°,and also a second attack of coryza. Out of 100 women, 60 suffered from menstrual irregularity and 79 from ovarian pain. In one case, a girl of 12 years and 3 months, who had never menstruated, was seized with influenza, and on the fourth day lost a considerable amount of blood, the rash appearing on the next day.

Trephining for Cerebral Hemorrhage.— Dr. W. Stewart, of Leith, has reported a case of successful trephining for middle meningeal hemorrhage at the point of center coup. A man, aged 46, fell into the dock, striking a wooden pile. He became unconscious 20 minutes after the fall. He had convulsive seizures, beginning with dilatation of pupils and conjugate deviation of the eyeball to the *right*, then spasms of the *left* side of the face, left arm, left side of the body, and left leg, followed, after an internal of 20 seconds, by convulsions of whole of *right* side of the body. As this seizure passed off, the eyeballs deviated to the *right*. A scalp wound was found leading to unfractured bone 1½ inches above base of *left* mastoid process. Blood escaped from the right nostril only. Dr. Stewart trephined over the middle meningeal artery on the *right* side. About six ounces of blood escaped, but the bleeding stopped on removal of the disc of bone. The wound was dressed, and the convulsions ceased, the patient making a good recovery and resuming work in 2½ months.

Trephining for Epilepsy.— Mr. Harrison Cripps, of St. Bartholomew's Hospital, has recently operated upon epilepsy by trephining. Both cases have been successful, the fits not having recurred.

Immunity against Pneumonia.— Drs. G. and F. Klemperer [*Berliner Klinische Wochenschrift*] have conducted experiments on the immunity against, and the cure of, pneumonia. They found that any nutrient medium in which the pneumococcus had grown, even after removal of the coccus itself by filtration, immunised against the pneumococcus-septicæmia. Also they found that an exposure to a temperature of 60° to 65° C., for one or two hours, made the immunising solution more efficacious. In all cases a certain time elapsed after the introduction of the immunising matter before the immunity was obtained; in introvenous injections it was 3 days, in subcutaneous, 14 days. The serum of the blood of animals whose immunity against large doses of virulent cultures was established, was found to cure pneumonia already in progress, if introduced into the circulation. The temperature fell to normal in 24 hours in 12 cases.

The authors consider that the blood serum of immune animals cures by rendering harmless the poison which the pneumococci have already formed. They call this poison "pneumotoxin;" it has been isolated and causes the pyrexia. After it has lasted a few days, another substance —"anti-pneumotoxin"—is formed, and counteracts the pneumotoxin. They found that the post-critical serum of blood of persons who had recovered from pneumonia, cured rabbits ill of that disease. The pneumococcus may live in the human body on sound mucous surface without doing harm.

Resistance of Sputum Pneumococcus.— Dr. Bordoni-Uffreduzzi, of Turin, has experimented on the resistance of the pneumococcus of sputa to the operation of drying and exposure to diffuse daylight and to the rays of the sun. He found the resisting powers great. Inoculations from sputa that had been dried for 55 days, caused the death of rabbits in 4 days from diplococcal septicæmia.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE RATIONAL TREATMENT OF HEPATIC AFFECTIONS.[1]

BY DUJARDIN BEAUMETZ,

Member of the Academy of Medicine, Physician to the Couchin Hospital, Paris.

ANTISEPTIC FUNCTION OF THE LIVER.

General Considerations.— The size of the hepatic gland has long attracted the attention of observers. The Chinese, struck by the color of this gland, attributed all the various modifications of coloration in the skin to disorders having their origin in the liver. In the time of the ancient Greeks, it was upon the appearance of the liver of immolated animals, that the diviners based their predictions. Plato made it the seat of desires, and Hippocrates, the origin of the veins; but it was Galen who attributed to the liver the most important role. According to him, this organ furnishes to the blood the nutritive juices necessary to its formation, and in addition, it secretes not only the bile, but the atrabile. All dyscrasic maladies, according to the physician of Pergamos, are dependent upon hepatic disturbances.

We should not forget that the ancient Greek physicians frequently observed these disorders of the liver. Hepatic congestions are very often observed in the southern part of our Continent, and at the present day, Greek physicians remark the frequency of the bilious state complicating inflammatory disorders. Until the seventeenth century, the ideas of the physician of Pergamos prevailed, and the bile, especially the atrabile, played a preponderant role in the pathogeny of humeral affections; but the discovery which was made on June 23, 1622, in the Anatomical Amphitheater of Pavia, by Prof. Gaspard Aselli, of Cremona, relegated the functions of the liver to a decidedly inferior rank. Aselli discovered on opening the liver of a dog, the chyliferous vessels, and, convinced of the importance of this discovery, he cried, "Eureka!" after the example of Archimedes; and since that time, the important role which had previously been attributed to the liver, has been attributed to the chyliferous vessels.

In spite of the efforts of Paracelsus and Boerhaave, who revived the ideas of Galen, and wished to make of the liver an abdominal heart, these notions were not generally received, and the liver, considered as an organ devoted simply to the secretion of bile, occupied only a very inferior rank in the glandular system of of the economy.

However, pathological anatomy had pointed out, as mere curiosities, some interesting facts; but these were only isolated cases, and it is not until the middle of the eighteenth century that we find the first work devoted especially to the study of hepatic diseases. This treatise was by Bianchi, and bears date of 1725. It was entitled, "Historica Hepaticæ." From this time, we find appearing successively, in England, the treatise of Saunders in 1768, of Bath in 1777, and finally the first French work appeared in 1812, written by Portal. This treatise is of the most mediocre character, and it is rather a reproduction of English works than an original work of the author. Since that time, some very important work has been done upon the pathology of the liver: Frerichs in Germany; Murchison, Harley, and Robert Saumby in England; Charcot, Hanot, Gilbert, and Chauffard in France, have furnished us some precise facts upon hepatic pathology, which will be useful in the course of these lessons.

But do not expect me to treat, in these lessons, upon all affections of the liver. I refer you to what I have already said in my "Clinique Therapeutique;" in this lesson I propose something different. Taking for a foundation the recent discoveries which physiology has made respecting the hepatic functions, I shall give you in these general considerations, the clinical and therapeutic conclusions which result from these researches.

These physiological labors have restored the liver to the rank which it should occupy, and one may say that if by its volume and its weight it occupies the first place among the glands of the body, it should also be recognized that this first place cannot be disputed by any other glandular system. The liver has, then,

[1] A series of lectures delivered by Prof. Dujardin Beaumetz, published in the *Bulletin General Therapeutique*, and translated expressly for this journal.

reacquired to-day, the high importance which Galen attributed to it.

Considered as a whole, the liver possesses two great functions: it is a digestive gland; it is a blood gland. As a digestive organ, the liver is the seat of the following important functions: It is a barrier interposed between the digestive tube and the rest of the system, to arrest and destroy alkaloids and toxines introduced into the digestive tube as foods or medicines. It is thus the organ of antisepsis.

The liver is, in addition, charged with the secretion of bile, which, as you know, plays a very important part in the regular action of the digestive tract.

Finally, it is the organ of a function which is peculiar to itself, viz., the regulation of the glycogenic functions of the body, that is to say, to furnish to the blood the exact amount of sugar necessary for the maintenance of life.

One might add still to these important functions, another, viz., the regulation of the absorption and production of fat.

As a blood organ, the liver may not only be considered as an abdominal heart, but it also plays an important part in relation to the blood globules and in the production of vital combustions and of animal heat; that is to say, in the production of urea.

Considered then from the point of view of its digestive functions, we shall have to study the liver as an organ of antisepsis, as a biliary organ, as a glycogenic organ, and as a fat-producing organ.

From the point of view of its blood-functions, we shall have to examine the liver as a hæmato-poietic organ, and as a calorigenetic organ.

I propose to study each one of these functions of the liver by itself, and will commence with the liver as an organ of antisepsis. I shall overlook the fat-producing function of the liver, but shall dwell lengthily upon each of the other functions of this organ.

Each of my lessons will be divided into two parts; in one I will show that the functions which I attribute to the liver may be established upon a physiological and anatomical standpoint. Then in the second part, we will, from these facts, draw some clinical and therapeutic conclusions.

In taking a general view of the question of the liver as a destroyer of poisons, we are enabled to distinguish three periods. In the first, mineral poisons were especially studied. Orfila, then Pagannuzzi and Lussana demonstrated that mineral poisons accumulate in the liver; arsenic, lead, murcury, and iron may be recovered in the hepatic gland.

Since this period, it has been emphasized in legal medicine that the liver should be taken in judicial autopsies for the purpose of examination for the poison supposed to have been administered.

In the second period, which commenced in 1877, by the labors of Schiff, Hegger, and then Jacques, the destructive action of the liver upon certain vegetable alkaloids, such as curarine, daturine, morphine, strychnine, etc., has been ascertained.

Finally, in the last period, the discovery was made that not only vegetable alkaloids were destroyed, but that the toxines and tox-albumins were also destroyed by the liver with extreme rapidity. These discoveries were the result of the important work of Bouchard, and the remarkable thesis of his student Roger, published in 1886, from which I borrow the greater part of the facts which form the basis of this lesson.

What are the methods employed by physiologists in the study of the special action of the liver upon poisons? These processes are numerous, and may be summed up in three groups: the more primitive, that which was employed by Orfila, consisted in analyzing the substances of the liver, thereby searching for the toxic cause of poisoning. Schiff employed a process much more physiological. He made a comparative study of the results of injecting medicinal alkaloids by the veins of the general circulation and by the veins of the portal circulation. He thus demonstrated the difference in toxic effects, of doses administered by these two ways. He employed this method especially with the rabbit and the dog.

For inferior animals, the frog, for example, Schiff employed another very ingenious proceeding, which was to deprive the frog of its liver, an operation comparatively easy of performance, and which allows the animal to survive for three or four days. He then compared the toxic action of the vegetable alkaloids in healthy frogs and in those deprived of their livers. Hegger and

Jacques, of Belgium, employed quite another proceeding,— that of an artificial circulation according to the method of Ludwig. They proceeded as follows: Immediately after having killed a dog and ligated the portal vein, also the inferior vena cava vein, they removed the liver, preserved that portion of the side of the organ which is adherent to the diaphragm, and also the diaphragm; placing the organ thus removed from the body, upon a support, they made pass through it a current of water or blood, and then examined the effect upon the toxic agents which had been introduced into the portal vein.

Let us add, finally, that Bouchard and Roger have also studied the blood of the general circulation and that of the portal vein from the point of view of their toxicity, and also that of the inferior vena cava. Let us now examine, as briefly as possible, the results furnished by these different researches. I will be very brief concerning the action of the liver upon the mineral substances. Arsenic, copper, antimony, and mercury accumulate in the liver. Roger, who has undertaken these experiments, has shown that the liver has no action upon the salts of potash or of soda; that, on the contrary, the action is very marked upon the salts of iron. When one injects by a mesenteric vein a solution of lactate of iron, the toxicity is three times less than when the injection is made into the veins of the general circulation. I shall recall, in relation to this claim, that Pagannuzzi, of Padua, had previously insisted upon this point, and that Lussana had maintained that the reconstituent effects, and especially the hæmato-poietic properties of the ferruginous preparations were due to the action of the salts of iron upon the hepatic cells. The ferruginous preparations introduced through the digestive organs to the liver, when eliminated by the bile, are recovered from the surface of the intestine by the portal veins.

The action of the liver upon vegetable alkaloids is very important. Hegger, in 1873, was the first to call attention to this destructive action of the liver, but we are indebted to Schiff for the most interesting work upon this subject, which appeared in 1877. Three years later appeared the work of Jacques, which was still more complete and of the greatest interest. Finally Roger has reviewed all these experiments and completed them. The accompanying table, which I extract from the last named work, shows clearly the action of the liver upon alkaloids and how great is this destructive action in the case of certain alkaloids.

The figures in this table speak for themselves, thus: for quinine in the case of a rabbit, the fatal dose per kilogramme of the weight of the body, is .9 gr. when one injects the poison by the veins of the ear; it requires 2.5 gr. when the poison is injected into an intestinal vein, or nearly three times as much. The figure is still higher for atropia; in the case of the rabbit, 6 gr. produce death when injected into the vein of the ear, and 3.0 gr. when injected into the intestinal vein. The liver here destroys more than three fourths of the poison.

For hyoscyamine in the frog, the fatal dose after removal of the liver, was only one half that previously required.

But it is with nicotine that the destructive action of the liver attains its maximum, at least for the frog. In a healthy frog, it requires 34 milligrammes (half a grain) to produce death. After the liver has been removed, 8 milligrammes (⅛ of

Substance injected.	Species of animal employed.	Condition of animal..	Method of injection.	Average No. Gr. required to cause death.
Sulpho-vinate of quinine	Rabbit.....	Healthy	Vein of ear.....	.9
			Vein of intestine.....	2.5
Hydrochlorate of morphia	Rabbit.....	Healthy	Vein of ear.....	5.4
			Vein of intestine.....	10.5
Sulphate atropa.....	Rabbit.....	Healthy	Vein of ear.....	.6
			Vein of intestine	3.0
Hyoscyamine.....	Frog	Healthy.....	Lymph sac	3.0
		Without liver...	Lymph sac.....	1.5
Sulphate strychnia.....	Dog	Healthy	Vein jugular.....	3.
			Vein mesenteric.....	1.5
Curare.....	Rabbit.....	Healthy	Vein of ear.....	.04
			Vein of intestine	.1

gr.) suffice to produce the same result. In relation to the nicotine, the method of procedure is such as to show clearly that it is the hepatic tissue which acts in this case. The process consists in triturating the alkaloid with the hepatic substance, then injecting it into the veins of the ear.

While without trituration, seven milligrammes are necessary for each kilogramme of the weight of the body to kill the rabbit, after trituration with the liver, 15.34 milligrammes are required.

What therapeutic deductions may be drawn from these results? — Some conclusions of the highest interest.

This destruction of vegetable alkaloids by the liver explains the great difference which exists between the administration of medicines by the mouth, and by the hypodermic method.

When administered by the mouth, drugs may be modified by the action of the gastric juice and of the other digestive fluids, but they meet especially that living barrier, the liver, which in part destroys them. Nothing of the sort occurs when the hypodermic injection is employed, hence the interest we have in the propagation of the hypodermic method when alkaloids are used.

This fact was known long ago, as regards curare and certain venoms of serpents. It was known, in fact, that one may practice suction of the wound made with poisoned arrows or by venoms of animals without experiencing the least poisonous effect, and Claud Bernard had even carried the analysis of this problem farther with curare, showing that it was not the gastric juice to which this diminution of toxicity should be attributed, esinc in injecting the mixture of curare and gastric juice under the skin, it caused the death of the animal as before. To-day we have the explanation of this fact in the destructive action of the liver.

It is probable that the liver does not completely destroy the alkaloids. It must store a certain portion, which, later, eliminated by the bile, is thrown into the intestine. This fact explains the cumulative effects of certain alkaloids or glucocides. We see, at times, toxic effects produced by long-continued therapeutic doses. It is probable that this effect may be explained either by a diminution in the destructive action of the liver, or by the fact that, the bile throwing into the intestine a quantity of the toxic substance, an accumulation occurs in the intestine, which being added to that introduced by the mouth, converts a therapeutic into a toxic dose.

But the most interesting point in this question of the anti-septic function of the liver is that which relates to the animal alkaloids. Some physiologists have been for a long time struck by the fact that in spite of the introduction by the digestive tube of numerous toxic substances, man exhibits no phenomena of poisoning. Stich was the first to formulate the fact that there must exist some point in the economy where these poisons are neutralized, which he thought to be a true dialyzing membrane preventing the penetration into the system of poisons contained in the intestine. Hofmeister attributed this property to the white globules of the blood.

After the publication of the works of Schiff, the destructive role of the liver was recognized, and Lautenbach was the first to express this fact in the most precise fashion. He maintained that the liver not only destroys the poisons introduced into the economy, but also, that in the physiological condition, the system produces a poison which is destroyed by the hepatic gland as rapidly as produced. The work of Lautenbach appeared in 1877.

Since then the work of Bouchard and the successful experiments of his student Roger have established the fact that one of the most important functions of the liver is to destroy not only the toxines introduced with the food, but also those which are produced by the living organism.

What is the origin of these toxines? They have four origins: first they are derived from the foods which are introduced into the digestive tube. When we use as food animals which have been killed more than three days, we introduce, thereby, a certain amount of toxic ptomaines. I do not wish to return to this question of alimentary ptomaines, which I have already considered in my lessons,[1] and I refer you, upon this point especially, to what I have said upon the subject of prophylaxis through regulation of the dietary, and upon the vegetarian regimen.

The second origin of these poisons,

1 Hygiene Prophylactique, 1890, p. 193.

which also concerns the digestive tube, is found in the fermentations which take place within the alimentary canal. Tanret had first shown that the gastric juice in acting upon albuminoid substances, produced some substances giving the reaction of alkaloids. It was then shown that, especially in morbid conditions of the mucous membrane of the stomach and intestine, a great amount of these toxic substances are produced, constituting together a condition termed intestinal putridity.

A third source of poison destroyed by the liver, is the result of the action of numerous microbes which are found in the digestive tube in normal and abnormal conditions, from the mouth to the anus, — microbes which secrete diastases and toxines.

Finally, the last origin is to be found in the living of the cells of the body. Gautier, in fact, has shown that the animal cell manufactures toxines, as well as the vegetable cell, and these toxines are eliminated by the intestine. We shall see, when I shall speak to you of the biliary function of the liver, that the bile is a means of elimination of these poisons, more active, perhaps, than the kidneys. In summarizing, then, these several sources of toxines, we must recognize it as an undeniable fact that the intestinal contents include a great quantity of alkaloidal substances of a toxic nature, which would penetrate the system, if, thanks to the portal circulation and the antiseptic function of the hepatic cells, they were not each moment destroyed and neutralized.

How can one demonstrate, experimentally, the preservative function of the liver? — By two experiments which furnish evidence absolutely positive in character.

The first consists in taking a certain quantity of the toxic products found in the intestine, and inoculating an animal with them, the rabbit for example, and making with them comparative inoculations, employing a vein of the general circulation, as a vein of the ear, in contrast with a branch of the portal vein; or one may employ the same products in the inoculation of healthy frogs and those which have been deprived of the liver. This was done by Roger, and the following table shows the result at which he arrived: —

	Method of injection.		Relative toxicity.
	Peripheral V.	Portal V.	
	c.c.	c.c.	
Putrid substances (alcoholic extract	22.2	54.2	2.31
Peptones	1.69	4.07	2.4
Carbonate of ammonia	.29	.40	1.61
Lactate of ammonia	.63	1.13	1.8
Alcohol	7.77	9.44	1.2
Beef bile	4.0	6.0	1.5
Human urine	34.3	67.4	2.0
	Frogs.		
	without liver.	healthy.	
Alcoholic extract of intest'l matters { Rab's.	7.7	27.7	3.6
Alcoholic extract of intest'l matters { Dogs.	9 4	19.2	2.0

This table shows very clearly the preservative function of the liver.

But the second mode of procedure gives results still more striking. It consists in the study of the difference in toxicity between the blood of the hepatic vein and that of the portal vein. The toxicity of the defibrinated blood of the dog, as shown by the injection of rabbits is as follows: —

	No. of c.c. required to kill a kilogramme of rabbit.
Blood in general	24.4
Blood of the hepatic vein	23.3
Blood of the portal vein	9.0

We see, then, that while the blood of the hepatic vein has a toxicity slightly inferior to that of the blood in general, represented by 23.3 c.c. per kilogramme of rabbit, that of the portal vein is represented by 9 c.c.; that is to say, its toxicity is more than three times as great.

I have thus shown you by irrefutable evidence, that the liver arrests not only mineral poisons but also vegetable alkaloids and animal toxines.

In what portion of the liver is the seat of this special antiseptic property? Upon this question, Roger has sought to carry the point as far as possible. He has shown us, as I have already stated, that it is the parenchyma which possesses this special property, having the power, when mixed with toxic substances, to diminish their toxicity. It is probable that it is in the hepatic cell itself that poisons are destroyed; for, according to Roger, there is always a direct relation between the glycogenic functions of the liver and its antiseptic functions. Roger

thought, even, that perhaps sugar or some modification of the glucoses might, by acting upon the vegetable or animal alkaloids, diminish their toxic properties. These points being established, we will now consider what conclusions clinical therapeutics may draw in relation to the treatment of disease. This I will make the subject of my next lesson.

THE ACTION OF BACTERIAL PRODUCTS ON VASO-MOTOR CENTERS.

Dr. C. H. Bouchard recently presented before the French Academy of Science, a note on the above subject, which is of a great deal of interest to the medical world. We here present a digest of it: It was established by Conheim that the chief phenomenon of inflammation, is the diapedesis of the white corpuscles of the blood. He admitted that "the passage of the leucocytes outside of the vessels was the consequence of a vascular modification produced by the action of phlogogenous causes acting directly on the vessels." Physiologists, before and since the discovery of Conheim, have tried to interpret various other phenomena in inflammation, and particularly vascular dilatation. Some of them persist in thinking that the nervous system impressioned at its peripherical extremities at the point of action of the morbific cause, suffers either a paralysis of its vaso-constrictor centers, or an excitation in its vaso-dilator centers, and upon either hypothesis, the vascular dilatation which is produced by reflex means, places the vessels in a favorable state for the passage of the white blood corpuscles through their walls.

In 1890, Massard and Bordet established the fact that leucocytes possess a certain irritability which causes them to proceed in solutions toward certain attractive substances, particularly bacterial matters. This irritability is called in French, *chimiotaxique*, and is identical with a peculiar irritable property of certain vegetable cells demonstrated by Pfeffer. This property causes the white corpuscles to advance from the most diluted portions of a solution containing attractive matter, toward the most concentrated part. It was thought that this discovery had in it a new theory of diapedesis. At this moment, then, there are three theories of the phenomenon of diapedesis: (*a*) That which attributes it to a primitive alteration of the vessels; (*b*) to a reflex action producing secondary dilatation of the vessels; and (*c*) the activity proper of the leucocytes. These three theories are adaptable to the new idea which recognizes local infection as the cause of inflammation in the majority of cases.

Dr. Bouchard has recognized from the beginning, the particular irritability of leucocytes which caused these organisms to travel in the seat of the tissues of a local infection from the parts in which the bacterial products are the most diluted, to those where they are the most concentrated, arriving thus to the point where they are at the maximum of concentration, that is to say, in contact with the microbes. This progress of the leucocytes is a preliminary phase of phagocytosis, which takes place only when contact occurs with the microbes, when the englobing of the latter occurs. Thus, phagocytosis is reduced to these two terms: englobing and intro-cellular digestion, which, however, presupposes a search of the bacteria by the white corpuscles, which itself is preceded by diapedesis. The impression has gained ground that in inflammation, and more generally in the fight of the organism against local infection, there are, among other things, three acts which succeed and complement each other: 1. Diapedesis, which Conheim has indicated to us; 2. The search for bacteria, which Massard and Bordet have pointed out: 3. Phagocytosis, which Metchnikoff has revealed to us. Massard and Bordet think that the two first-named phases constitute only one; that the attraction by bacterial products on leucocytes is sufficient to make them migrate through their vascular walls. But Dr. Bouchard has opposed this view, because of the fact that the plasma of the blood which constitutes the inflammatory œdema, passes with them,—oozes even before them,—and may get out without them, and yet it is not believed that the plasma has any irritability such as is understood to exist in leucocytes.

He has demonstrated further, that one of the bacterial products, by its general action on the economy, renders impossible the chief act of inflammation, viz., diapedesis. Charrin and Gamaleia have

completed the demonstration, in establishing the fact that this special product opposes equally the issue of plasma and the inflammatory vascular dilatation. This is produced by the paralyzing power of this substance on the vaso-dilator centers; it acts on the nervous system, modifies and prevents active vascular dilatation. Bouchard has termed it "anectasine." Anectasine prevents local diapedesis by its general action, no matter by what process one may try to provoke it; it paralyzes the vaso-dilator centers, thus preventing inflammatory congestion and inflammatory œdema. Bouchard has thought that it is also by this paralyzing property of the vaso-dilator centers that it opposes diapedesis. He has succeeded in preventing it by intra-venous and also by subcutaneous injection of anectasine, both by introducing it into a spot remote from the seat of the attractive substances secreted by the microbes, and also by introducing it directly in their midst. An important property of this anectasine is, that it prevents not only the issue of plasma and white corpuscles, but also of the red blood corpuscles to which no *chimiotaxic* irritability is attributed. In fact, it stops hemorrhage. Bouchard has observed it in man in five cases of hæmoptysis, and in three cases of intestinal hemorrhage. Anectasine does not intervene in inflammatory processes, unless it be as a moderator, or as an agent of restraint. From this point of view it may take its place in antiphlogistic remedies.

There is another bacterial substance which Bouchard has pointed out, the general action of which is the excitation of the vaso-dilator center, and which brings in the region whence proceeds the irritation, a more energetic reflex congestion, a more abundant exudation, and a more intense diapedesis, just the reverse of the substance above described. In certain organs, such as the kidneys, lungs, and retina, its vaso-dilating action may be manifest even without provocation. This substance which is antagonistic to anectasine is named "*ectasine.*" He has discovered it in Koch's tuberculine.

It will be observed that this knowledge of the action of these bacterial substances, to the effect that in some instances the vessels may restrain the passage of white blood corpuscles and even all the other elements of blood, to the point in fact of preventing hemorrhage, or may on the other hand, allow excessive migration of leucocytes and effusion of plasma, is of a great deal of importance to the practicing physician, and a subject which promises very fruitful indications in therapeutics. P. P.

Pain and Inflammation of Dental Origin.— Dr. Hugenschmidt (*La Semaine Medicale*) admirably sums up the differential symptomatology and treatment of the two principal classes of pains of dental origin. In the first class, the cause of the pain is acute inflammation of the pulp of the tooth; in the second class, the cause of the pain is an inflammation of the periosteum covering the alveolus. The characteristic symptoms of acute pulpitis are, intense neuralgic pain in the region supplied by the fifth nerve, the point of the maximum intensity being at the root of the affected tooth, which is the seat of the disease. The pain is increased by the inhalation of cold air, or taking into the mouth any hot or cold liquid, or bringing in contact with the tooth any hard substance, as the seeds of fruits. The pain may be constant or intermittent; it is often lancinating in character, and frequently there will be found sensitive points on the temples, or just below the orbit of the affected side. Examination of the affected tooth will usually disclose a carious cavity which has extended so deep as to have reached the pulp cavity. The proper treatment is to wash out the cavity carefully by means of a stream of warm water injected from a small syringe, using also, if necessary, a stilette with a little bit of cotton wrapped about the end of it. After the cavity has been thoroughly emptied, a bit of cotton should be placed in the cavity, after having been saturated with either of the following solutions: Menthol, 18 grs., chloroform, 30 grs.; or, hydroclorate of cocaine and hydrochlorate of morphia, each, 4 grs., and creosote sufficient to make a paste of the consistency of cream.

If neither of the above mixtures can be obtained, pure creosote or carbolic acid may be employed. Great care must be taken to avoid burning the surrounding parts. A minute bit of cotton moistened with acid should be placed in the bottom of the cavity, and then the cavity should be filled with dry cotton; the last bit of

cotton may be advantageously moistened with collodion, which will exclude the fluids in the mouth. When the pain is due to periostitis, it is different in character; the pains, though lancinating, are continuous, never intermittent, only ceasing when the inflammatory products have found their way to the surface.

The seat of the cause of the inflammation is usually a dead pulp. The tooth which is the seat of the inflammation, becomes more and more sensitive, until it cannot be touched without severe pain, and the patient cannot eat on the affected side. The tooth is not sensitive to cold air, and very little or not at all sensitive to hot or cold liquids. During the first twenty-four hours the inflammation may sometimes be relieved by freely bathing the gum in the neighborhood of the affected tooth with equal parts of laudanum and tincture of iodine. Care must be taken not to apply the remedy too freely. Bathing the gum with a mixture consisting of 5 grams tincture of iodine, 1 gram tincture of aconite, 9 grains of hydrochlorate of cocaine is still more powerful in relieving the inflammation, but in the majority of cases, the only means of radical cure will be removal of the pulp of the tooth, or extraction of the tooth.

The important point is to recognize the difference between inflammation of the alveolar periosteum, and an acute pulpitis. J. H. K.

Analogy of Migraine to Epilepsy. — Dr. Ch. Féré, physician of the Hospital Bicêtre, of Paris (*La Semaine Medicale*), calls attention to the fact that, in certain cases of chronic migraine, there is a condition entirely analogous to that commonly known as the epileptic state. The epileptic state is characterized by a convulsive period and a period of relaxation and weakness. In the first period, the convulsions, while not continuous, recur before the stupor of the preceding attack has ceased. In migraine, the attacks may occur in a continuous series ending in a period of prostration or stupor. M. Féré has observed three cases of this kind, of which one is especially interesting. The patient was a man of forty-three years of age, of an arthritic family; he had been subject to migraine since the age of eighteen years. Besides these effects, the patient enjoyed good health, and had no other nervous troubles.

The attacks of migraine in this patient, were confined to the right side of the face; the disease was at first simple in character, but since 1870, following a severe chill, the attacks had been accompanied by sensory and motor disturbances of a varied character, among which were homonymous hemianopsia, scotoma, photopsia, a sensation of ocular tension with hyperæsthesia of the integument about the left eye; roarings and whistlings in the left ear, and disturbances of the gustatory sense (a taste of ink), and also of the olfactory sense (an odor of copper), heaviness, and paresis of the left side of the face and of the tongue, also of the left arm, and sometimes of the entire left half of the body. The paretic phenomena persisted during a period of time varying from a half hour to two hours after the attack, then gradually disappeared.

For eighteen years these attacks of migraine were repeated about twice a month; then in 1888, following prolonged insomnia, the attacks began to appear in series of four, five, and even nine, followed by a greater paresis than before, and profound stupor. One day the patient remained unconscious for about eleven hours. On another occasion, during the period of stupor, the patient left his bed without knowing it. One attack was followed by complete motor aphasia, which, however, soon disappeared. This time, neither sleep nor stupor followed the attack. It was after this attack that M. Féré saw the patient for the first time. He prescribed hydrotherapy and bromide of potash, which was at first given in doses of four grams (60 grains) daily. But the crisis continued about twice a month, until the dose of bromide of potash was increased to eight grams (120 grains) daily. The attacks, however, were less intense than before, and with a dose of six grams (90 grains) per day, they were rarely followed but in sleep. From the day when the patient commenced taking eight grams of bromide of potash per day, he has had only one attack, which was without either sensory or motor complications, and it has not been followed by a subsequent attack, although sixteen months have elapsed. The bromide of potash has been tolerated at the dose named, and has produced no other inconvenience than some acne

which has rapidly disappeared under the remedies used to secure intestinal antisepsis. J. H. K.

New Treatment for Chronic Laryngitis.—This disease which, in its dry form is sometimes termed pachydermy of the larynx, has long been recognized by all specialists as a disease exceedingly difficult to cure,—indeed, practically incurable, usually ending in complete aphonia, either constant or intermittent. The disease is most frequent in persons addicted to the use of alcohol. Dr. J. Scheimann, assistant in the Laryngological Polyclinic of Berlin, has recently observed that local applications of feeble solutions of acetic acid are a very efficient means of treatment of this obstinate disease. The remedy applied is as follows: The patient is made to inhale two or three times daily, for ten minutes at each time, a two or three per cent solution of acetic acid pulverized by an atomizer. A small quantity of the solution is also thrown into the larynx every day, by means of a syringe. It is said that the treatment is not disagreeable for the patient, and that under its influence the thickened parts become more transparent, the tissues soften, and the thickening disappears. The voice also returns and the hoarseness gradually disappears.

Antisepsis at Bergmann's Clinic.[1]—The present disposition is to replace antiseptics by more perfect asepsis, which is more certain, more effective, and less dangerous for the tissues and the operator. The instruments are first mechanically cleaned by a brush, and rubbing with unbleached linen, to which Bergmann attributes the greatest efficiency, as a means of removing from the instruments fatty matters which produce bacteria from the action of chemical disinfectants.

Sterilization of Dressings.—Bergmann employs sterilizing ovens through which steam is made to pass from above, downward. To avoid handling, dressings are previously placed in metallic boxes, the sides of which are perforated. These boxes are wrapped up after the sterilization, thus avoiding handling the dressings. The boxes are submitted to the action of steam in an oven for three quarters of an hour, and are not opened until the dressing is to be applied.

Sterilization of Metallic Instruments.—After cleaning by the brush and unbleached linen, the instruments are sterilized, either by steam, hot air, or boiling water. The proceeding recommended as the most simple, is, first to brush with soap and water, then boil from ten to fifteen minutes in a one-per-cent solution of carbonate of soda; fifty per cent more soda should be added if the water is hard. After cooling, and during the operation, the instruments are placed in boiled water containing one half per cent each of carbonate of soda and carbolic acid.

After operation, the instruments are first washed in pure cold water, then immersed and brushed vigorously in a one-per-cent solution of soda to which soap has been added; then rinse and finally polish with a polishing stone and alcohol, or with a bit of chamois skin. Lastly, wash with a solution of carbonate of soda, and carefully dry.

The brushes are sterilized by boiling in the soda solution for twenty or thirty minutes, and are kept immersed in a one-half-per-cent solution of corrosive sublimate. J. H. K.

Antiseptic Treatment of Burns.—Mr. A. E. Maylard, B. S., Glasgow, has had great success in the antiseptic treatment of burns. His method is as follows: The clothes having been removed, the wound is washed with a solution of perchloride of mercury (1–2000), then covered by green protective (oiled silk) steeped in the solution. Over this is placed a piece of boracic lint, wrung out of the same solution, and this is again covered by gutta percha tissue. The whole is enveloped in sublimated gamgee tissue and then bandaged.

The advantages claimed are: 1. The parts are sterilized by the burn, and are kept sterile. 2. No active inflammation takes place, and hence no further death of tissues. 3. No copious purulent discharge. 4. Infrequency of removal of dressings. 5. Little or no pain connected with such removal. 6. No offensive odor. 7. The necrosed tissue is rapidly thrown off by the growth of healthy granulations. 8. The resulting cicatrix is the least possible, from the fact that the parts are preserved, which might otherwise, from septic influences, have died. 9. The process of healing is unimpeded by any local disturbances. W. B. J.

[1] *Archiv für Klinische Chirurgie*, t. XLII, p. 123.

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

Eberth's Bacillus and the Bacillus Colli.— MM. Rodet and Gabriel Roux (*La Semaine Medicale*) maintain that the simple passage of the bacillus of Colli through the human organism transforms it into the typhoid bacillus of Eberth. Their theory is, that this does not occur in all persons, but only in those persons who are susceptible to typhoid fever. MM. Chantemesse and Widal contend that the difference between these two organisms is always maintained. While most of the characters of these two organisms are very similar, the last-named experimenters maintain that the typhoid bacillus differs from the bacillus of Colli, in that it will not produce the fermentation of lactose (milk sugar) in bouillon, while the bacillus colli causes the prompt fermentation of lactose and the coagulation of milk.

Phagocytosis and Immunity.— An interesting discussion has been going on recently in the Pathological Society of London, in which the various theories of immunity are considered. The disputants are chiefly divided into two classes, the phagocytocists and the humoralists. Dr. William Hunter, Assistant Physician to the London Fever Hospital, presented many cogent facts and consistent arguments, which seemed to reconcile the adverse positions held by the chief defenders of the two theories. According to Dr. Hunter, the facts in a simple case of immunity are briefly these: In an unprotected animal, a subcutaneous inoculation with virulent bacteria produces general infection without local change, while in protected animals, inoculation with the same bacteria produces a local inflammation with a great gathering of leucocytes, but no general infection. It is evident that some change in the body of the animal is the cause of this phenomenon. The question under discussion involves the nature of this change. Bacteria produce three forms of poisons: 1. Toxines, easily diffusible substances of an alkaloid nature, which act in a manner similar to vegetable alkaloids; 2. Those diffusible substances which are of a proteid nature, and which are very imperfectly known. These are termed tox-albumins; 3. A class of substances which are known as proteins, belonging to the class of albumoses, which are derived from the bodies of the bacteria. The first two substances, which are very active poisons, are derived from the bacteria when they are alive and active. The proteins are derived from the bacteria when dead or dying. This class of substances has the remarkable property of attracting leucocytes. Metchnikoff has shown that the leucocytes possess not only the scavenging power to pick up and destroy dead matters found in the blood, but the ability to capture and destroy invading microbes.

Behring and Nissen have shown that the power which the body possesses, of resisting certain bacteria, is proportional to the antibiotic or germicidal properties of its blood serum, it being shown by experiment that the serum of animals rendered immune, has strong bacteria-killing power, while that of the ordinary animal furnishes a favorable medium for the growth of bacteria. This last-named fact forms the basis of the doctrines of the humoralists. Dr. Hunter well maintains that it is illogical to attach to the serum and plasma of the blood, which are themselves the product of cell action, a greater power than is granted to the cell itself. Whatever properties the serum and plasma possess, they must have derived from the cells by which they are formed. The experiments of Metchnikoff have shown that these cells, which are largely concerned with the formation of plasma and serum, the leucocytes of the blood, the lymphocytes and the cells of the spleen, are particularly active as phagocytes. The weakness of the humoral theory is also shown by the persistence of the immunity in certain cases. The fluids of the body are certainly more changeable than the cells, and it is evident that the permanency of immunity must be due to the changes in the cellular structures of the body. These two doctrines, the phagocytic and the humoral, are evidently mutually complemental; one is incomplete without the other, though certainly the humoral theory must be regarded as subordinate to that of the phagocytosis.

J. H. Adami, M. A., M. B., of Cambridge (*British Medical Journal*, March 5), sums up the results of researches of

as related to pneumonia, in the following succinct manner : —

"1. Immunity against pneumonia can be bestowed upon susceptible animals by introducing into the tissues the sterilized products of growth of the pneumococcus. This immunity is, in general, but of a temporary nature.

"2. Such immunity induced by injection of bacterial products does not immediately manifest itself; indeed fourteen days must elapse before the simple products bring about their effects. But if the sterilized products heated either to 106° or 107.5° F. for three to four days, or to 140° F. for two hours, then injections induce immunity within four days.

"3. The warmed vaccine leads to a reaction of but short duration; the unwarmed brings about a long-continued febrile state, at the end of which the animal becomes immune.

"4. Thus the fever with its elevation of temperature, and the antecedent heating of the vaccinial material induce the same result. One or other process would seem to be necessary in order that sterilized bacterial products develop immunity.

"5. But further, the blood serum of a protected animal injected into the veins of a susceptible animal, confers immediate immunity. There is no delay. Evidently, therefore, some substance is present in the blood serum of an animal made immune — a substance not present in the sterilized culture fluids of the pneumococcus. The bacterial products therefore, do not *per se* bring about immunity, but through the febrile reaction, some other body having immunity-conferring properties, is gradually developed.

"6. What is more, this same substance has curative properties, acting, not so much on the pneumococci themselves (for in its presence these continue to proliferate), but upon the poisons or toxines manufactured by them.

"7. Hence Klemperer and Klemperer distinguish two proteids, the pneumotoxine which can be isolated from cultures of the pneumococcus, and the antipneumotoxine to be obtained from the serum of immunized animals."

Traumatic Tetanus Cured by Anti-Toxine of Tetanus. — MM. Tizzoni and Cattani showed last year, that the blood of animals which has been artificially rendered restrictive to tetanus contains an anti-toxic substance which is an antidote for the poison of tetanus. They call this substance "The Anti-Toxine of Tetanus."

M. Schwarz has recently reported the case of a young peasant, 15 years of age, who received a wound upon the left forearm while gathering walnuts. Curiously, his sister, some time before, had received a wound by falling, in the same place, and subsequently died of tetanus. Some days after the accident, there were some symptoms of contraction in the left arm, then in the jaw, in the face, and finally in the legs and the muscles of the back. The young patient was at first treated by chloral and hot baths, then by subcutaneous injections of phenic acid, but without result. The contractions became general, and tetanic crises followed. Subcutaneous injections of 15 centigrammes of anti-toxine were then made, the substance being furnished by the serum of a dog, which had been rendered refractory to tetanus. The patient complained of strong burning sensations in the region of the injection, then experienced some sensations of relief, but the contractions were not diminished in intensity. The next day, a second injection of anti-toxine was made, the same quantity being employed, and an injection of 25 centigrammes was made the day following, and on the next day, another injection of the same amount. On the morning of the fourth day the patient was so much improved that he could easily open his mouth, and could eat with appetite, employing his hands in eating. On the fifth day he was entirely well.

Diminished Bactericide Property of the Blood Serum of Rabbits Vaccinated against Pneumonia. — Under this head, M. Mosny recently communicated to the French Society of Biology the following note : —

"The serum of rabbits vaccinated against infectious pneumonia, is far from being a bactericide, for pneumococci, when placed in it, are insured a longevity greater than that observed in any of our artificial culture mediums. They preserve, in fact, all their vegetative action, and in part also, their virulence, during a month at least; while, at the end of four days, the same pneumococci placed in the serum of unvaccinated rabbits, lose their virulence and their vitality.

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THE ABUSE OF TONICS.

THERE is perhaps no class of remedial agents more abused than tonics. The abuse consists both in the excessive use and the misapplication of this class of agents which, within a restricted field, possess an indisputable and important therapeutic value. The misuse of tonics is doubtless the outgrowth of a misconception of the real nature of this class of remedial agents and its limitations. Many physicians also seem to lose sight of the fact that tonics are, as has been aptly said of drugs in general, two-edged swords, which are as capable of mischief as of benefit. Indeed, when the true nature of tonics, as is true, in fact, of most medicinal agents, is thoroughly understood, it is apparent that even in cases in which they accomplish the maximum of benefit, there is also a certain amount of injury inflicted upon the organism, so that the effect obtained is really and simply the difference between the mischief done and the good accomplished. If the difference is on one side, the total result is benefit; if on the other side, the result is harm. This principle holds good with regard to most remedies, whether the means employed is a drug or a non-medicinal agent.

The popular idea of a tonic is well expressed in the following definition, which we find in the National Medical Dictionary: "An agent which augments gradually and permanently the strength and vital activity of the body or its parts." A stimulant is defined by the same authority as being "an agent which increases the functional activity of any organ or series of organs." The distinction made seems to be that a stimulant produces temporary excitement, whereas a tonic produces a permanent increase of strength and vital activity.

A careful study of the physiological effects of the various stimulants and tonics very clearly shows that upon the point in question there is really no difference whatever. The only way in which strength and vital activity can be really increased, is by an increase of the metabolic processes of the body. Alcohol and strychnia may be taken as good representatives of the two classes of drugs named stimulant and tonic. What is their effect upon the metabolic processes of the body? The experiments of T. Lauder Brunton and others have shown conclusively that both alcohol and strychnia lessen oxidation in the system. In the case of both drugs this is due to the toxic effect of the drug upon protoplasm. The metabolism of the body depends upon oxidation. Without oxidation there can be no tissue change and no evolution of energy. How then can an agent which lessens oxidation produce a permanent increase of strength and vital activity? Here is a paradox which no writer upon therapeutics has explained.

Alcohol produces an apparent increase of strength; we say apparent, because the experiments of Parkes and others have shown that the actual amount of work done by a person under the influence of liquor, is less than without it. That the effect of alcohol (which is essentially the same as that of other stimulants) is only that of excitation, an effect which is very transient in its influence, was well shown by experiments made upon the soldiers of the British army during the Ashantee campaign. It was found (quoting Lauder Brunton, italics ours) that "when a ration of rum was served out, the soldier at first marched more briskly, but after about three miles had been traversed, the effect of it seemed to be worn off, and he then *lagged more than before.*" These

experiments, as well as many other similar ones, show clearly that the effect of a stimulant is simply to increase the evolution of energy, but not to replenish the sources of energy in the body. In connection with the experiment referred to, experiments were also made in the use of beef-tea, which were shown, to use Dr. Brunton's words, "to have as great a stimulating power as rum."

Now what is the effect of strychnia? Again quoting Dr. Brunton, who is as good authority as can be mentioned in connection with the subject: "The most marked feature in the general action of strychnine, is the great increase which it produces in the *reflex excitability* of the spinal cord and other reflex nerve-centers. . . . When the dose is large, this increase is so great as to cause convulsions and death. . . . The drug lessens oxidation of protoplasm and oxidation taking place in the blood." It is evident then that strychnia lessens the process by which energy is naturally developed within the body, while at the same time increasing the excitability of the nerve-elements, and thus leading to an increase in the expenditure of the energy stored up within the body. In other words, strychnia, like alcohol, increases the expenditure of energy, without increasing its production, but on the contrary, lessening those tissue-changes upon which the development of energy depends. It is also noticeable that the effect of strychnia, when used in small doses, is precisely the same as that produced by doses sufficiently large to produce death, only less in degree.

A careful study of the matter will convince any candid person that the only real difference between the drugs called stimulants and those called tonics, is, that the reaction following the excitation produced by those called tonics, is less immediate, and hence less apparent than in the case of those drugs which are termed stimulants. One reason for this, in the case of strychnia, is in the fact that the drug is slowly eliminated. This characteristic of the drug should always be kept in mind in its use, since it gives to strychnia a cumulative effect which sometimes results disastrously through the failure of the kidneys to eliminate the poison with the usual degree of activity. Strychnia seems to be one of the most lethal of drugs, in consequence of the fact that the only outlet for the poison is through the kidneys. One of its most marked properties, when taken in a large dose, or when its cumulative effects are experienced, is to cause contraction of the arteries of the kidneys, thus lessening their activity, and, in extreme cases, causing complete suppression of the renal functions. A case recently came under our professional care, in which convulsions had been produced by ordinary medicinal doses of the drug, doubtless the result of lessened activity of the kidneys.

A ready resort to tonics in the great variety of cases in which there is lack of energy, lowered nerve-tone, mental or physical depression, weak digestion, sexual weakness, and similar morbid conditions indicating low nerve-tone, is often productive of the greatest mischief. Suppose, for example, a man is suffering from depression as the result of excessive work, either mental or physical: a tonic preparation containing strychnia or nux vomica will give him increased power of activity; in other words, by increasing the excitability of the nerve-cells of the brain and spinal cord, the disposition for activity is increased, and consequently the patient not only continues his over-work, but may actually increase his daily expenditures of energy. What must be the necessary result? The drug administered, diminishes oxidation, and hence lessens tissue-change and force-production, while at the same time, through the deceptive sensation of increased capacity for work which it produces, it is increasing the amount of force expended. There can be but one result; sooner or later the patient finds himself completely bankrupt in energy, and in a worse condition than before. The writer's professional experience has brought him in contact with a large number of just this

class of cases. The patient had hoped much from every tonic employed, including the use of strychnia, which had often been pushed almost to the point of actual poisoning, and the constant observation has been that no real headway was made toward *permanent* recovery, so long as the patient was kept in a state of artificial excitability by the use of tonics. The bad effects of this unscientific method in therapeutics is most apparent in cases of sexual debility, in which strychnia and other powerful tonics have been used for their aphrodisiac effect. Under the influence of the drug, the patient is made to believe that his sexual powers have been fully restored, and is thus led to further indulgence of the very kind which has led to his diseased condition.

In the case of mineral tonics, the slowness of their elimination is often a source of great mischief to the system. Mercury, which in small doses is held to be a tonic, iron, and all the metallic salts are to a considerable extent taken out of the general circulation and stored up in the liver. The same occurs in a lesser degree in some other structures of the body. Doubtless great mischief sometimes results to the liver through this fact. An inactive liver is not likely to be greatly benefited by the accumulation within its structures of a mineral substance which, in the case of mercury at least, must be highly detrimental to the vital activity of the cells. The vast quantities of iron used in this country, as a tonic, must be responsible for an enormous amount of liver inactivity.

The fact is indisputable that great mischief is done to vast numbers of patients through reliance placed upon tonics as a means of restoration to health. Tonics are sometimes undoubtedly useful as a means of temporarily relieving conditions of depression, especially when the depression is of such a nature as to cause the patient to become dispirited and melancholy; but when used in such cases, the reliance upon the tonics should only be temporary, and the greatest care should be taken to see that the causes which have induced the depressed condition are removed, otherwise the tonic will be likely to do more harm than good. Restricted by this rule, the use of tonics would be reduced so greatly that the great majority of the long list of remedies named would probably disappear from our materia medicas, and the few remaining ones would seldom be resorted to, since through a removal of the cause, most of the patients would recover without resorting to remedies which are the most abused, and we think we might almost say, the least needed, of all rational therapeutic agents. J. H. K.

AN EXCELLENT OPENING FOR A MEDICAL MISSIONARY.

We are glad to place before the readers of the Bacteriological World and Modern Medicine, the following circular issued by two ladies, Mary and Margaret Leitch, who have for seven years been missionaries in Ceylon; the address of the ladies is No. 17, Layfayette Place, New York: —

"We are very desirous of finding a fully qualified physician to go as a medical missionary to Ceylon under the American Board. We would be truly grateful to you if you could direct us to any one who you think would be a suitable candidate. He should have had a good general and a thorough medical education, with some hospital or private practice. He should be a man of earnest piety who would consecrate his talents to the service of Christ. He should possess sound health and some executive ability, as the work he will be called to do among 316,000 people in the northern province will be a large and important one. He should be a married man. We are hoping to find one who, with his wife, would be able to go to Ceylon at least by the end of this year. He would be expected to take up and extend the work of the late Samuel F. Green, M. D., a missionary of the American Board for twenty-two

years in Ceylon, who, during the last years of his stay in that island, treated, with the aid of his native assistants, as many as 10,000 patients a year. The salary of the doctor and his wife ($1,200 a year, the salary usually paid to missionaries in Ceylon), also the amount required for outfit and passage, have been secured.

"In Ceylon there is a large, comfortable mission house ready for their use, also a dispensary, and a building for medical students; and the funds are now being pledged for the erection of a large hospital, the American Board having authorized us to secure $10,000 for that object. There will be an income from the country from fees of paying patients and Government grant which will amount to over $1,000 a year, which may be used in the conduct of the work. The endowment of ten beds in the hospital, and of ten scholarships, has been given or promised, also the sum of $90,000 is promised, in legacies legally executed, toward a general endowment. There are at present eight missionary families in the province, working in connection with the American and two English missions. There are about 3,000 native communicants in the churches of these missions, and about 15,000 children in their mission schools. There are several higher educational institutions, girls' boarding schools, an industrial school, and a flourishing college. Tamil is the vernacular of the people, but the English language is becoming widely known. The field is an exceptionally attractive one, and the outlook hopeful.

Indigestibility of Cheese. — Von Klenze (*Allgemeine Medizinische Central Zeitung*) has recently made a series of very careful experiments for the purpose of determining the degree of digestibility of cheese, which is so largely used with the idea that it is an aid to digestion. Dr. Klenze studied the digestibility of a large number of different kinds of cheese, employing an artificial digestive fluid, which contained, however, a quantity of fresh gastric juice. The conditions supplied, were as favorable as possible for rapid and complete digestion. Here are some of the results: Length of time required for the digestion of Emmenthaler, Gonzoler, and Neufchatel was eight hours; Romadour required nine hours, and Kottenberger, Brie, Swiss, and all but two of the eleven remaining varieties required ten hours for digestion. When it is remembered that the stomach digestion of an ordinary meal is usually completed in four or five hours, and in a vigorous stomach in even less time, it is apparent that cheese is a great hinderance to digestion rather than an aid to it, and that there is not even the semblance of a foundation for the old distich,—

"Cheese is a mighty elf
Digesting all things but itself."

That cheese is indigestible is not to be wondered at. Microscopical and bacteriological studies of cheese show that it swarms with microbes of various sorts, and, as is now well known, the flavors characteristic of the different varieties of cheese are wholly due to the products of microbic action; the older the cheese the more numerous the microbes, hence the greater probability that its presence in the stomach will set up fermentative or putrefactive changes in the food-substances which have been eaten. Prof. Vaughan's researches have shown that cheese always contains a larger or smaller amount of tyrotoxicon, and doubtless also the microbes by which this powerfully toxic agent is produced. Cheese must certainly be regarded as a questionable article of diet. It should be mentioned, however, for the benefit of those who will insist upon retaining it in their dietary, that its most noxious properties may be neutralized by cooking. If the sterilization of milk is a wholesome and advantageous proceeding, certainly the sterilization of cheese is a dietetic duty which ought not to be neglected, since

milk contains only about 6,300,000,000 microbes per quart, while the proportion of these organisms found in cheese is vastly greater. J. H. K.

Removal of the Appendages for Epilepsy.— Dr. Joseph Price recently read an interesting paper before the New York Neurological Society, entitled, "The Surgical Treatment of Epilepsy." The plea of the author was not in favor of operations upon the perineum, but was in favor of the removal of the uterine appendages as a means of curing the disease of epilepsy in women. Tait showed, years ago, that the removal of the appendages has a decidedly modifying influence upon the disease, especially in those cases in which the paroxysms occur only at the menstrual period, or in which the paroxysms were greatly aggravated at that time. The paper was not received with the great enthusiasm which might have been expected from a society devoted to the study of nervous disorders, nevertheless the facts presented by the author appear to be cogent, and while we can scarcely indorse the idea some years ago expressed by Tait, that every epileptic woman ought to have her ovaries examined when the disease does not yield to other means of treatment, yet we feel sure that there are cases in which the operation is indicated. Nearly two years ago, the writer removed the appendages of a young woman who began to suffer from epileptic paroxysms occurring only at the menstrual period and almost immediately after the first appearance of menstruation. Since the operation, but one or two slight attacks have occurred. The patient is practically well. In a similar case operated upon more recently, sufficient time has not yet elapsed to determine the permanent results. J. H. K.

The Cause of Chronic Degenerative Disease of the Spinal Cord. — In a paper read by Dr. Charles L. Dana, before the Congress of American Physicians and Surgeons last October, primary degenerations were classified as follows: —

1. Locomotor ataxia; 2. Lateral sclerosis; 3. Compound scleroses; 4. Multiple sclerosis; 5. Progressive muscular atrophy.

The usually recognized incurability of these affections renders the discovery of their cause a matter of great importance, especially as such a discovery might lead to the development of means for arresting the further advance of the disease, even though it might not be cured. The theory which Dr. Dana accepts as the most probable, is that which he terms "The Toxine Theory." Sclerosis is regarded by Dr. Dana, not as a result of inflammation, a process which is now generally recognized as concerning only connective tissues and blood-vessels. The microscope indicates the chief change to be gradual decay and death of the nerve-fiber and cell. In some sclerosis, as that of locomotor ataxia, this process is accompanied by the development of leucomaines or tox-albumins, which irritating substances may perhaps be charged with setting up those changes which are noticed in the connective tissue elements in this disease. Analogy certainly seems to favor the idea that degenerative processes in nerve-tissue are due to the presence of an organic poison of some sort which may be the result, either of a germ poison in the body, or of some change in the cells produced by a germ present at some previous time. The frequency with which degenerative changes follow typhoid fever, measles, scarlet fever, smallpox, and syphilis, is a circumstance which accords well with this theory.

This view is certainly a somewhat hopeful one, as it holds out the promise that at some future time, perhaps in the near future, we may discover some means, either of eliminating or of antidoting the poison by which these destructive changes are provoked.

Reviews.

Stories of a Country Doctor. — By Willis P. King, M. D., Kansas City, Mo. Hummell and Parmele, Drexel Building, Phil., publishers.

The expectations of all those who know Dr. King will be aroused for a treat in anticipation of reading this book (2nd edition), and they will not be disappointed, if they can enjoy a good laugh. It is a very interesting and a most amusing volume. It relates, as only Dr. King can relate, the trials, tribulations, and experiences of a country doctor in the Southwest. The "doctor" has been made the hero of a good many works of fiction and of a number of humorous publications, but we doubt if truly professional experiences have ever furnished ground for a more readable and enjoyable book. It is one of those light and mirthful publications which dispel the blues from the young country doctor's brains, and will provoke laughter in the city physician. A dollar spent in its purchase will be many times repaid in the recreation that it will give to both mind and body.

Is Man too Prolific? — By H. S. Pomeroy, A. M., M. D. Funk & Wagnalls, publishers, New York.

Syphilis in Ancient and Prehistoric Times. — By Dr. F. Buret, Paris, France. Translated by A. H. Ohmann-Dumesnil, M. D., St. Louis, Mo. This is the first volume of this work (to be completed in three). This volume is remarkable for its thoroughness, its thought, and its practical and scientific value. It must have entailed enormous, patient research, and consumed a great deal of time. If we are to judge of the two volumes to come by this one, as we are doubtless justifiable in doing, we can say that the work will prove a most valuable addition to medical literature, both in a historical and practical sense. The notes of the translator are not the least in practical importance. They constitute a very useful addition, and will be read with interest. The translator is to be congratulated on the success of his arduous task, and the English-reading physician will find the volume a rare specimen of usefulness in his profession.

Tables for Doctors and Druggists. — By Eli H. Long, M. D. A most useful accessory to the library of every practitioner and every druggist. It contains five tables: Solubilites; Reactions and Incompatibles; Doses and Uses; Specific Gravities, Poisons and Antidotes. An excellent book. Geo. S. Davis, publisher.

Ethics of Marriage. — By H. S. Pomeroy, M. D., New York; Funk & Wagnalls. The author of this book takes high and strong grounds against the sins committed under the cloak of matrimony, one class of which the author denominates "The Perversion of Marriage," and calls "The American Sin," a term which was first used on the other side of the Atlantic. Under this head are considered the various methods by which unborn human life is destroyed. We are glad to see that the author takes the strongest possible ground against this heinous crime. The book deals with various other questions, such as "The Family and the State," "The Mission of the Child," "Heredity," "Woman's Work," "Over Population," etc. We heartily commend the work as being sound and wholesome, and in no respect uncertain in its tone. We trust it may have a wide circulation.

The International Medical Annual for 1891. — Edited by P. W. Williams, M. D.; New York, E. B. Treat. The reputation which the "International Medical Annual" has won for itself renders encomium scarcely necessary. Within a space of not quite 600 pages, the author, aided by a long list of able physicians, surgeons, and medical authors, condenses the essential features of progress in the various departments of medical science within the last year. The concise, yet thorough and practical manner in which the various subjects are treated, enables the

author to compress into this small compass the essentials of the new discoveries which have been made in remedies and treatment for disease, new medical inventions, progress of sanitary science, climatology, and other departments of hygiene, and various other practical branches of medicine, so that this volume may fairly be pronounced to be the most valuable for the general practitioner of all the medical publications of the year. The work is well printed, and is illustrated by a number of chromo-lithographic plates.

The publisher announces that he has already in press for early publication, for 1892, the tenth volume of the "Annual," which will contain over six thousand references to disease and remedies, making a volume which ought to be in the library of every physician.

The Dog in Health and Disease. — By Prof. Wesley Mills, M. A., M. D., D. V. S., etc. D. Appleton Co., publishers.

This work of 400 pages is a magnificent presentation of the origin, history, breeding, education, and general management of the dog in health, and his treatment in disease. It has 38 full-page cuts, besides colored plates and many other illustrations. We think it is by far the best English work published on the subject, to date. It is written in the clear and interesting style well known to Dr. Mills, and cannot fail to prove of much value to lovers of the canine, and of natural history. It is a volume worthy of close inspection; we have no doubt it will receive the consideration which it merits.

The Essentials of Bacteriology.— By M. V. Ball, M. D., Assistant in Microscopy, Niagara University, Buffalo, N. Y. W. B. Saunders, 913 Walnut St., Philadelphia, publisher.

This little book of 159 pages, is perhaps the most concise and practical compendium which we have yet seen, upon the subject of which it treats, in the English language. It is a well illustrated volume, in which everything relating to micro-organism to date, is stated, tersely and in a practical way. It cannot fail to render a great deal of service both to physicians in practice, to students, and to laboratory workers. Its price, one dollar, is certainly very low for the great amount of material which it presents.

On Double Consciousness.—By Fred. Binet. The Open Court Publishing Co., Chicago, Ill.

Monism and Milliorism.— A philosophical essay on causality and ethics, by Paul Carus, Ph. D. F. W. Christern, 37 West 23d St., New York, publisher.

The Idea of God. —By Paul Carus, Ph. D. The Open Court Pub. Co., Chicago, Ill.

The Ethical Problem.— By Dr. Paul Carus. The Open Court Pub. Co., Chicago, Ill.

The Work of Medicine for the World.— By C. H. Hughes, M. D., St. Louis. Published by the Alienist and Neurologist, St. Louis, Mo.

Tobacco, Insanity, and Nervousness.— By Dr. L. Bremer. Meyer Bros., druggists, publishers, St. Louis, Mo.

Price-list of Veterinary Instruments.— Jacob J. Teuffel & Bro., 114 S. 10th St., Phila.

Femoral and Ventral Hernia in Women, and the Kangaroo Suture.— Two articles illustrated in one monogram, by Henry O. Marcy, A. M., M. D., LL. D., Boston. W. J. Dorman, publisher, Phila.

The Scientific Rationale of Modern Wound Treatment.— By the same author. Printed at the office of the American Medical Association, Chicago, Ill.

Apparatus for the Collection of Dust and Fungi, for Microscopical and Biological Tests.— By Samuel G. Dixon, M. D. Geo. S. Davis, publisher, Detroit, Mich.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., MARCH, 1892.

A PECULIAR CASE OF MALIGNANT DISEASE OF THE UTERUS.

MRS. F., age fifty-two, had suffered from a pelvic disease for one and a half years previous to her introduction into the Sanitarium, Dec. 10, 1891. Had a bloody discharge from the vagina, more or less constantly during the above period. She was suffering from hemorrhoids, constipation, cold extremities, broken sleep, and various functional disturbances. The discharge followed the menopause and continued to this date. She complained of pains in the left ovarian region over crest of ilium. The diagnosis arrived at was malignant disease of uterus, probably extending into the broad ligament. Microscopical examination, so far as the tissue itself was concerned, indicated sarcoma, but it was not satisfactory. Throughout this diseased tissue there existed a filamentous growth (vegetable) to be described further, which gave to the case a decidedly peculiar character. On the 13th of Jan., 1892, the patient was placed on the operating table, when the cervix was found badly diseased. On the left it was almost entirely gone, and on the right some excrescences protruded and bulged into the vagina. The entire uterine wall seemed invaded. Some of the pathological tissue felt dense and at other parts it felt softer. Considerable infiltration seemed to involve the latter side of the os and uterus. In stretching the mouth open a large quantity of offensive pus was discharged. Dr. Kellogg excised the prominent growths and curetted all the diseased portions thoroughly. The pus and tissue, being gathered, were submitted to microscopical examination. The following is the report thereof:—

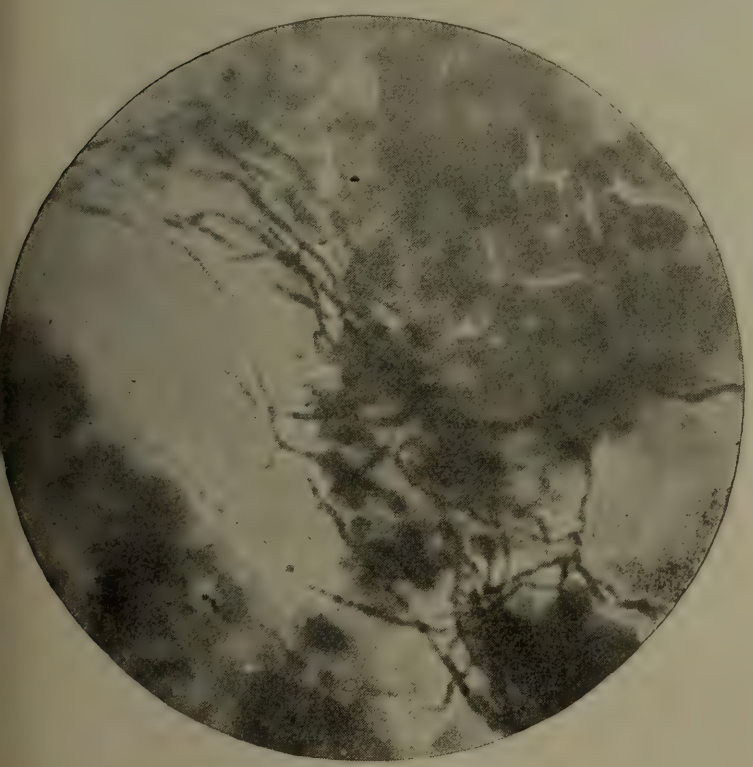


FIG. 1. 500 DIAM.

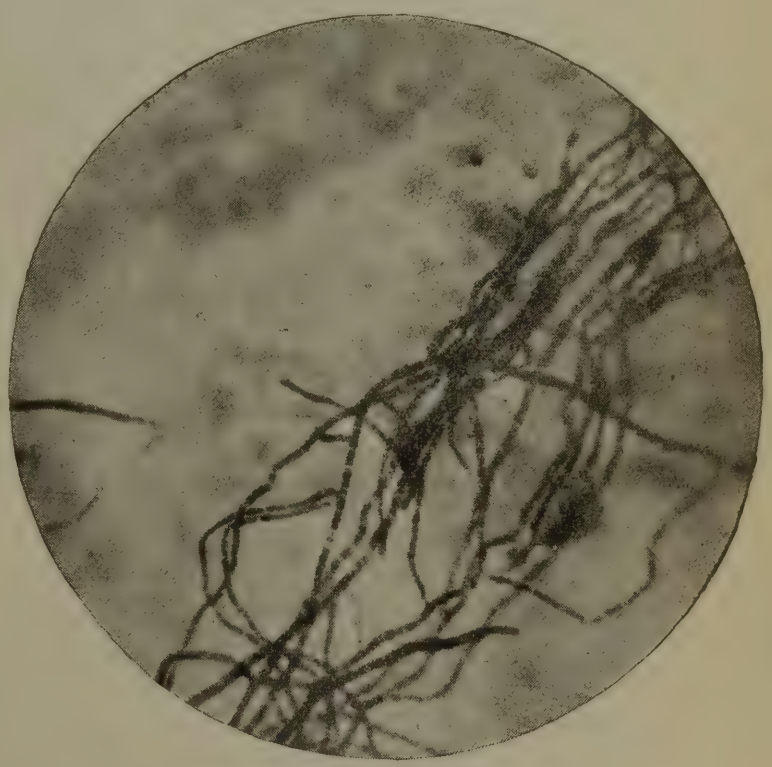


FIG. 2. 500 DIAM.

The pus presented no special interest which, from a purely microscopical standpoint, needs mention at this moment. Cultures under way may bring some interesting features, which, in such an event, will be reported later. The peculiarity of the case existed in the pathological tissue itself. Histologically, it had the character of a sarcoma, but throughout its structure,

appeared ramifications of filaments which seemed to belong to the class of micro-organisms known as cladothrix. (See frontispiece and accompanying cut.[1]) On making the sections, after freezing the tissue, those filaments, branching in various directions, presented the appearance of mycelium penetrating between the cells of the tissue. They were quite loose, and on breaking up the fresh tissue could be separated and isolated from the section. Unstained, they were not distinguishable, but stained with hæmatoxylon they presented a dark appearance with bright spaces or spots (as if spores were present) at regular intervals.

Now the question arises, Was this vegetable growth a secondary complication, or was it the primary cause of the diseased tissue? It is possible that the pathological condition only afforded a proper field for the parasitic development. Yet it is not improbable that at the period of the menopause, these organisms began to develop somewhere about the uterus and gradually invaded its walls, thereby producing the condition explained. Perhaps further studies will clear the doubts, as the patient, after curetting, and painting the surfaces well with iodine, made a fair recovery. Should the disease reappear, the uterus will probably be excised, when further investigations will be instituted. Should the cure be complete, we will have a good indication as to the nature of the malignancy or benignancy of the case. If a true sarcoma, not due to this parasite, the case is likely beyond redemption by the operation done to date. P. P.

INFECTIOUS ABORTION.

Infectious abortion has been known in live stock for a number of years. Investigations of this disease have been made in France among cattle and sheep by Prof. Nocard and others. The writer had an opportunity of investigating this malady somewhat cursorily in cattle in the State of Missouri. In Illinois, Dr. Williams, then of Bloomington, made an inquiry of infectious abortion in mares, for the United States government. It seems pretty well understood by all these investigators, that the cause of this (like all other infectious maladies), is some form or other of micro-organism, or perhaps an association of micro-organisms under certain circumstances. Dr. Williams made some tests by the introduction into the vagina of a portion of the placenta from fresh cases of abortion, and, I believe, succeeded in producing the malady in one case out of seven. It seems, however, that there have never been any prolonged and satisfactory bacteriological studies supported by inoculations and trials of other kinds, with cultivated virus, with perhaps the exception of the work which has been done here and there, at various intervals, by some European authorities, concerning abortion in cattle.

A few weeks ago I was called to Montana, to institute researches concerning an outbreak of abortion in the famous Daley ranch at Riverside, Bitter Root Valley, Mont. Mr. Marcus Daley, having perhaps a million and a half dollars invested in that mammoth institution, and having lost in the neighborhood of $75,000 worth of colts and mares through this malady, had decided to search for the cause by all possible means, and desired that all scientific and practical tests should be made, for the purpose of arriving at the bottom of the trouble. The object of my visit was to study the cause, from a bacteriological and pathological standpoint, and also to make such experiments and investigations as might be found necessary, upon the ground. It was found that out of some 30 odd cases of abortion, in every instance, the disease existed between the placenta and the uterus; a disorganization of tissue had taken place there, and loosened the two organs. It was found that at the outset, probably only a small colony of micro-organisms began the work of destruction in some portion or other of the adherent uterine and placental walls, and by gradually gaining ground, the separation became more and more extensive until finally expulsion took place.

In cases in which the disease occurred just about the time of parturition, or say a week or two before, birth was hastened, and sometimes the foal was born alive but died within a day or two, sometimes a few hours after birth. The naked eye lesions, when perfectly fresh, were as follows: The loosened portion of the placenta was smooth, soft and slimy to the touch, and very friable. It was easily torn, and the surface affected, very readily scraped with the nails or a knife. After a few hours, the parts were grayish in appearance. Sometimes this was the case at the time of expulsion, denoting, very likely, still more transformations of the affected parts by the action of micro-organisms. The line of demarkation between these diseased portions (there was only one, more or less extensive), and the healthy portion of the placenta, was unmistakable. The latter one

[1] The cuts are from excellent photographs made by Prof. H. J. Detmers, Columbus, Ohio, from a poor mount. They are not intended to show the nature of the tissue, but merely the filaments and their location.

had the characteristic red appearance to the eye, and sound solid feeling to the touch which is always found in ordinary cases of abortion in mares, while adjoining was the peculiar appearance of the dead diseased tissue, as just described. From the nature of the lesions and their locality, it seems evident that the introduction of the micro-organisms occurred by the vagina. From the fact that the mares presented no premonitory symptom, and that it was therefore impossible to detect, more than an hour beforehand, any animal that was about to abort, and that no record exists as to pre-existing fever, it seems quite likely that the virus could not have been introduced into the placental region by the circulation of the mother. However, tests are being made to determine that point, if possible. But that the disease is transmissible, is unquestionable; the history of the cases referred to demonstrates this fact very well.

The first cases that occurred were separated a mile or two from other ranches. Several cases took place in this first outbreak. Then the animals which had been exposed, and I think some that had aborted, were transferred to another ranch, where some other brood mares were grazing. Some sixteen or eighteen days afterward, the disease broke out in the latter place. This is only one instance pointing to the transmission of the disease. There are other facts connected with this outbreak, which point to the same conclusion, but which I need not relate here.

The preventive treatment instituted at the outset, was such as was suggested on general principles by the nature of infections, *i. e.*, quarantine of the healthy stock away from the diseased animals and infected grounds; quarantine of those which had already aborted, on the ground where the abortion took place. An antiseptic douche to be wisely administered was also recommended for the ani mals which had been exposed and had not yet aborted, in order to keep the vagina and the vulva as free from micro-organisms as possible.

The microscopic study of the disease, and of these micro-organisms is yet incomplete, and it is possible that it will take some time to come to a satisfactory conclusion. We can say conclusively, however, that one form of cocci largely predominated in the diseased walls, and is possibly connected closely with the disease from an etiological standpoint. Bacteriological researches at the Laboratory of Hygiene in this Institution are now under way, and we hope, ere long, to be able to present further points of interest and of practical utility to those interested. Experimental tests are under way; more will be hereafter instituted to sift this question as thoroughly as possible.

We trust that these investigations, conducted at great expense to Mr. Marcus Daley, may be of utility not only to the owners but to the country at large. P. P.

DISINFECTION OF BUILDINGS, ETC.

Among the most interesting investigations which have ever been made, from a sanitary standpoint, are those concerning the disinfection of buildings. In order to put this phase of sanitary science on a more rational basis than the mere washing or general fumigation, steaming, etc., it is necessary not only to study the nature of the organisms existing in the building to be disinfected, but also their location, their protection by various furniture, wall-material, and even realize the quantity of germs existing. M. Duclaux, in the *Annales de l' Institut Pasteur*, February number, publishes an excellent review of the studies which have been made of the disinfection of walls. From this article we quote largely, and receive inspiration for these notes.

In the first place we must remember that in any kind of building, the floors, walls, etc., vary a great deal, not only in their physical structure, conformation, and the kind of material forming them, but also in regard to the temperature and the surroundings which make them more or less favorable for germs. For example, the walls, the ceiling, and the floor of a parlor must necessarily differ greatly from those of a bedroom, a kitchen, or a dining room, and again, from a garret. On the other hand, from a bacteriological standpoint a room in which a tuberculous person has lived differs from a room in which a variolous patient or a diphtheritic patient has sojourned. Again, we find that a room bathed in sunlight, receiving a great deal of daylight, is likely to be poorer in the quantity of germs than one which is kept darker, or in the shade. The damp ceiling, at warm temperature particularly, harbors also more germs than a dry wall, at any temperature. Again, a wall painted with oil is likely to be poorer in quantity of microbes than one with a rough surface in which they can be harbored. It is therefore quite reasonable to expect a varying quantity of germs in the same building, according to the conditions and kind of walls, flooring, ceiling, etc. This has been found universal, and proven by Esmarch in the best work which has been published on the subject. In his work he states

that he has found on a square portion of wall of 5 centimeters, germs in the following quantities: Stable-stall, limed walls, 7,087 colonies; laboratory, a glue paint, 115; laboratory, wooden door, 30; sitting-room, velvet wall, 19; same room, at another point, 158.

These quantities were gathered with a fine, sterilized wet sponge, and it is very doubtful, says M. Duclaux, whether they represent the proper ratio. They are probably not sufficiently high, for the method employed, and possibly the nutritive substance, may not have been sufficient to demonstrate all the colonies which could have been found. M. Gerloczy has discovered a vast number of germs left after using the Esmarch method, by simply scraping the walls and their surface. The above quantities, then, are likely to be too low.

Here is another tabulation of colonies found in various parts of another building,—the Hygienic Institute. The germs were gathered at a man's height: side of window, 6,070 colonies; side of window at a point adjoining the first, 6,391; opposite side same window 3,185; opposite side, at a point adjoining the preceding, 2,170; near the stall of an animal, 14,200; a meter higher, nearer the animal, 1,386.

Investigations demonstrate that the numbers decrease as we get higher from the ground, and in fact, that there are very few germs on the ceilings. The germs which have been found in all buildings by various investigators, among whom we may mention Canalis, Cornet, Kruger, Emmerich, Friedlander, Ullmann, and Kelsch, include a number of pathogenous forms, such as the bacillus of tuberculosis, pneumococcus, streptococcus of erysipelas, the bacillus of tetanus, and various pus and septic germs. It is against these dangerous elements that a good disinfection of the floors and walls of a building is necessary, particularly in hospitals where sickness has prevailed.

But it must not be expected that by even the very best of disinfection we can realize the absolute destruction of all these germs. It is only possible to realize a safe medium, or rather a cleanliness by which the dangerous germs will have been sufficiently destroyed or modified to make the rooms comparatively harmless. "A good disinfection," says M. Duclaux, "ought to include the following conditions: 1. It must insure the integrity of the walls and of the material, such as paper, paste, etc., that forms their covering; 2. It must be harmless to those applying it, and for those who will inhabit the disinfected apartment; 3. It must be easily applied, and cheap; 4. It should be efficacious."

People generally have little fear of the germs of any disease, until they have been affected by them, and then it is sometimes difficult to disinfect enough to satisfy them. Theoretically, it is expected to kill every germ of whatever description in a building. Practically, this cannot be reached. Of all these conditions of disinfection, it is evident that efficacy, though mentioned last, is the most important of all. If it is possible to have an efficacious disinfection, cheaply applied, so much the better, and it is a condition that ought to be sought; but if it is impossible without some cost, then efficacy ought to be the chief point considered. Esmarch has proposed various methods of disinfection, which we may consider in our next.

TECHNIQUE.

Clear Agar-Agar Culture Medium.—Every worker knows how difficult it is to obtain a clear, solid medium when agar-agar is used as solidifying agent, and every one knows also that sometimes it is darker and more cloudy than at others, although precisely the same method was used, the agar being of a different origin. It frequently happens that with the best care and the best filtration, even when albumen of egg is used, the medium remains too dark, or at least far from satisfactory, so far as transparency is concerned. This I am sure, often comes from dirt in the agar used. I have not experimented extensively with the following simple precautionary measure, but two or three recent trials make me believe that the medium can usually be much improved by it. It is this: cut the agar-agar fine with scissors, put in a large flask (or measuring-glass), add a large amount of warm water, and shake violently. Pour off this water and add a fresh quantity, shake again and pour off as before. Repeat the operation three or four times, always being careful to allow the agar to settle before decanting. Sometimes better results are obtained by leaving the agar in the third water, say about an hour or two, and then shaking and decanting. A cotton cloth may be used to filter the water off the agar-agar thus washed. In a word, it means a thorough rinsing of the agar before heating or melting it in any way.

Blood Fermentation.— Blood allowed to ferment by the action of the (various) microbes which prey upon it, produces carbonic acid, ammonia, volatile fatty acids, and fixed compound nitrogenous substances.

BULLETIN OF THE

MEDICAL AND SURGICAL SANITARIUM,

BATTLE CREEK, MICHIGAN.

THE purpose of this department is to constitute, together with the Bulletin of the Laboratory of Hygiene, a record of the scientific work in the Medical and Surgical Sanitarium located at Battle Creek, Michigan, an institution incorporated as an organized and self-supporting charitable enterprise, all the earnings of the institution being devoted to charitable medical work, and the advancement of scientific medicine.

BIENNIAL REPORT OF THE SUPERINTENDENT.

(Continued.)

SANITARIUM METHODS.

IT may not be inappropriate to present in this report a brief *résumé* of the general principles which underlie the medical work of a sanitarium conducted on rational principles, or at least which should underlie the work of such an institution, and the methods employed.

The word "sanitarium," or "sanitorium," was first employed to designate resorts for invalid soldiers, which were frequented not for the purpose of enjoying any special medical advantages but for the benefit of pure air, sea bathing, and cheerful surroundings. This is practically the sense in which the term is still very largely employed, as it is applied to a great number of institutions which are intended as resorts for invalids, but which offer as attractions simply climatic advantages or the supposed virtues of certain mineral waters from springs or artesian wells. But considered as a medical institution, a sanitarium, or at least a medical and surgical sanitarium, is a product of modern medical progress, and represents rational medicine in its most advanced and most progressive form.

It is everywhere recognized that within the last quarter of a century the science of medicine has made marvelous progress. Indeed, it may be said that more real advancement has been made in scientific medicine within the present century than in all the centuries which have preceded it. The central and fundamental idea in the work of this institution is the thought that health-getting is not a matter of magic nor of pill-swallowing, but rather a matter of training and education. The chronic invalid is sick, usually because he has neglected to supply the conditions necessary for health, or because he has by long-continued violation of the laws of health in various unhygienic practices, developed evil tendencies and morbid activities in his various bodily organs. The cure of such a patient must consist chiefly in a course of systematic training by which he will be educated out of his evil ways into better ones—by which his abnormal vital functions will be trained to normal and healthful activity. This course of training necessarily includes such discipline and regimen as will influence every disordered function. It involves absolute control of the entire life of the invalid. All his habits of life must be systematically conformed to such rules and principles as will efficiently and curatively modify his disordered vital processes.

Health is as much a matter of growth and development as is the growth of a tree or of a crop of wheat, and is as much dependent upon material conditions. By proper control and modification of his nutritive processes, the chronic invalid may be gradually grown or trained out of disease into health. By raising his whole vital status and improving his general physical tone, morbid conditions are left behind, the normal rhythm of vital activity is re-established; and health comes, not as the result of ingenious antidoting of morbid conditions, but as the result of the working within the body of that occult force recognized by the ancients, but so often forgotten in modern times, the *vis medicatrix Naturæ*. For two thousand years physicians busied themselves in hunting over the world of chemical compounds and botanical products, not even neglecting the animal world, in search of specifics or antidotes for disease; but modern medicine has taught us that it is the duty of the physician to study his patient as much as his malady, and to remember that it is the patient whom he is to cure rather than his disease. When the patient is cured, his disease has vanished, but, on the other hand, one may succeed admirably in the cure of a disease and yet find his patient even worse than before.

A large share of the patients who visit the Sanitarium have had their diseases cured many times. Their torpid livers have been cured again and again by cholagogues and liver stimulants of various sorts. Their diseased kidneys may have been many times "cured" by "Kidney Cures" and various vaunted specifics. Their indigestion has been cured scores of times by acids and alkalies, digestants, pep-

tones, tonics, elixirs, stomachics, etc. Their nerves have been toned up and toned down to the satisfaction of many successive medical advisers; nevertheless they are still sick, and have not infrequently reached a condition in which their jaded livers, kidneys, stomachs, or nerves have ceased to "react" to the remedies administered, so that in sheer despair they have "thrown physic to the dogs," and have abandoned themselves to their fate, or have, through the encouragement of some friend or advice of their physician, sought the Sanitarium as a sort of court of last appeal.

This is just the class of patients to which a sanitarium ought to be adapted. The temporary relief afforded by various medicinal agents is no longer of service. Radical means must be adopted, and for the successful employment of such means a well-regulated institution with its trained corps of attendants, its systematic rules and regulations, is absolutely indispensable.

The main idea in the Sanitarium, then, is health culture. The sick man is led to reform his unhygienic ways and is taught to do works of supererogation healthward.

First of all, the physician must be familiar with the condition of his patient. On the arrival of the patient at the Sanitarium, a careful account of his case is taken in writing. He is questioned respecting his father and mother, his grandparents, his uncles, aunts, brothers, and sisters, and sometimes more distant relatives. The purpose is to learn as much as possible of the quality of his constitutional tendencies, etc. His own personal history is carefully investigated, inquiry being made respecting the diseases from which he has suffered, his personal habits, etc. Then a careful inquiry is made into his present illness and its history. Every department of the body is systematically investigated—digestion, respiration, circulation, nervous system, etc.

After eliciting from the patient as much information as he is himself prepared to give of his case, a careful physical examination is made. The heart and lungs are carefully examined, not only by the stethoscope and other ordinary means, but in cases requiring it, the sphygmograph, pneumograph, pneograph, and other instruments of precision are brought into the right position. In fact, in making a physical examination of a patient, the methods of a physiological laboratory are very largely utilized. The advantage of getting this precise knowledge of the patient's case is beyond estimate, as it enables the physician not only to ascertain the patient's condition with great accuracy, but also enables him to determine at a very early period whether there is or is not a change for the better. A principle which is conscientiously observed in this institution is to retain no patient under treatment who is not improving, or is not likely to improve, and hence the anxiety to discover at the earliest moment possible any positive indications respecting any change in his condition for better or worse.

An examination of the stomach includes not only an inquiry of the patient respecting his condition, and looking at the tongue, but a careful examination of the stomach itself by palpation, succussion, clapotement, and in some cases by introducing a tube into the stomach and withdrawing a portion of its contents for examination. By these methods the exact size of the stomach and its real physical state are accurately determined, as is also the condition of the other abdominal viscera.

Each patient who enters the institution is required to present for examination, the entire amount of urine passed in twenty-four hours. This twenty-four-hour specimen is carefully examined quantitatively as well as qualitatively The analysis includes not only a statement of the acidity or alkalinity, but the exact degree of acidity or alkalinity. The amount of urea is also determined, also the exact quantity of sugar and of albumen, if these constituents are present. Examination is also made for the presence of toxines, ptomaines, etc., and for any other morbid elements which can be discovered by minute chemical analysis or by the microscope.

If a patient coughs and expectorates, a bacteriological study is made of the expectorated matters. If the patient presents symptoms which indicate a disease seated in the nervous system, a very elaborate investigation of the condition of the nerve centers is undertaken. The condition of the various reflexes, superficial and deep, together with the condition of the various classes of sensory nerves, are carefully studied. By the ingenious chronometer of Ch. Verdin, a determination of the rate of transmission of nerve energy is made in this class of patients, not only for the individual as a whole, but in many cases for individual parts of the body. Comparison is made between the two sides of the body. Determination is also made not only for the time required to feel and indicate a sensation, but for the time occupied by the brain in recognizing the sensation. Coördination is carefully tested, and any symptoms looking toward an organic affection of the brain or spinal cord are carefully studied with reference to an exact localization of the disease.

So far as possible in stomach disorders, the length of time required for absorption and the kind and degree of acidity present in the digestive contents at different times following a meal, are considered questions of importance to be determined by careful chemical study.

Before a prescription for exercise is made the patient is subjected to a careful study of his physique and the condition of his muscles. Any lateral or posterior curvature of the spine, or other bodily defects, are carefully noted, the exact strength of each group of muscles in the body, as indicated by a delicate and exact mercurial dynamometer, is recorded, and a chart made by which his weak points may be instantly recognized.

Such an examination furnishes the foundation for an exact and rational prescription for the patient. If the examination of the lungs indicates a disease of these organs, and the patient's temperature shows a high degree of activity, he is required to rest for some days until the activity of the disease has subsided under appropriate treatment, then will begin a series of exercises accompanied with inhalations, lung expansions with pneumatic apparatus, etc., for the purpose of expanding the lungs and increasing the amount of oxygen absorbed, properly medicating the diseased surfaces and fortifying the patient's system against disease. Special attention will be given to supplying him with very nutritious food taken in such quantities and at such times as will stimulate his nutrition to the highest degree.

If in case of disease of the heart, the examination indicates excessive heart weakness, perhaps with dilatation, the patient must have carefully graduated exercises of such a character as will strengthen the heart, combined with such Swedish movements, massage, and baths as will increase the surface circulation and thus relieve the heart. If the heart is enlarged by overgrowth from excessive compensation, rest in bed with absolute proscription of all exercise for one, two, or even three or four weeks, becomes a necessary prescription, the patient's strength at the same time being maintained and even augmented by passive exercise administered in such a way as not to excite the already over excitable heart.

The examination of the stomach will give the necessary indications respecting diet; as, for example, if the patient has a stomach which is dilated, its walls so weakened and relaxed as to be almost incapable of contraction, he must be provided with food which is well disintegrated, and hence will require little labor on the part of the stomach, and his digestion must be assisted mechanically by massage, either manually or mechanically administered to the stomach and abdomen at proper intervals after each meal. If the chemical analysis of the contents of the stomach shows a deficiency of hydrochloric acid, this must be supplied, and the stomach glands must be reinforced by the development of better blood and the employment of proper vital stimuli, such as electricity, massage, etc., to increase their activity.

So with every class of invalids. Each must have his specific wants considered and met by treatment. The nervous must not only receive a suitable prescription for diet, etc., but must be trained to self-control. The neurasthenic must be taught how to conserve nervous energy and how to cultivate nerve tone. The hysterical and hypochondriacal must be convinced of the dangers arising from self-inspection and self-centering of the mind, and must be cajoled into a healthful activity of mind and body.

A man with a bad stomach or weak liver must be taught how to give his stomach and his liver an easy time.

The chronic pill swallower must be weaned from his doses, and the paripatetic valetudinarian must be enthused with an ambition to become something better than a traveling museum of maladies. The woman who takes an inventory of her symptoms every morning lest one should have disappeared over night, must be jostled out of her invalid ruts, and must be inspired with a wholesome hatred of disease and an earnest determination to escape from its thralldom.

The whole institution must be kept full of sturdy ideas about health and wholesome living. Its very atmosphere must breathe of life and every room must be kept aglow with mental and moral sunshine through the agency of active and sympathetic physicians and efficient, good-natured nurses and attendants.

The prescription for exercise recognizes every possible condition which can modify muscular effort. Short-breathed patients, those suffering from organic disease of the heart, must be shown how to get the benefits of exercise by slow and moderately heavy exercises executed without "strain." The aged, and those who are permanently crippled by rheumatism or gout, must be taught the same lesson, and must especially be shown how to develop respiratory activity, although it may be too late to increase their lung capacity.

The obese, anæmic, the sedentary, and those who have become neurasthenic through idleness, must be made to work out their salvation by vigorous labor at the rowing machine,

the pulley weights, the Swedish gymnastics, and in the tread-mill. So much for general regimen.

Every patient receives careful prescriptions for diet and exercise as well as for baths, medicines, when required, etc. Among the facilities afforded by the Sanitarium, in addition to those already referred to, are the following:—

Extensive bath rooms, affording facilities for the employment of all recognized hydro-therapeutic measures; that is, every form of bath, general and local, hot and tepid, temperate and cold, as the case may require; vapor baths, Turkish baths, electric baths, electro-vapor baths, etc. The last addition to this department is the electric-light bath, in which the advantages of radiant heat are utilized. The heat from the incandescent electric light is found to penetrate a long distance into the body. In fact, when the unclothed body is surrounded with a multitude of glowing electric lights, it may be said without exaggeration that every fiber of the body is illuminated by exposure to the powerful influence of this remedial agent. It has been shown that plants grow under the influence of the electric light as under the influence of sunlight. Seeds germinate, and various vital processes are carried on as though exposed to the action of the sun's rays. The electric light bath is perhaps a complete substitute for the sun bath, and has the advantage that it is under absolute control. Any degree of effect desired can be produced. This bath was originated in the Sanitarium, and has not, so far as we know, been employed elsewhere.

Special attention is given to massage, with a corps of nurses and attendants including more than thirty trained manipulators. The system employed is in some respects peculiar to the institution, although not absolutely novel. It is made up of the most valuable features of the French, German, English, and Swedish systems of massage, and is modified, of course, to suit individual cases. In the manual Swedish movement department, manipulators who have been carefully trained by trainers direct from Sweden, do most efficient service in this line. The system is not employed in a haphazard way, as it is not left to the manipulators themselves, but is as carefully prescribed as medicines or any other class of curative agents.

The mechanical Swedish movement department is unique. It includes a larger number of different effective machines than will be found anywhere else in the world. A larger share of the machines employed have been invented and made especially for use in this institution, and with the exception of the few which have been copied, are not in use elsewhere. Additions are made to this department to accomplish some new thing, or to accomplish an old purpose in a more effectual manner.

The electrical department includes the most elaborate outfit to be found in any hospital or institution of any sort in this country. The electrical currents are dosed with the greatest care, not only as regards the strength of current employed, but also as regards the amount of actual electrical work done during the application.

Lectures two or three times a week give patients practical instruction in wholesome living, domestic hygiene, etc.

Physiological and chemical investigations are constantly being carried on at large expense for the purpose of determining the value of new remedies and developing new remedial agents. Such investigations are useful not only in their results but in maintaining in the institution and among the workers connected with it, a scientific spirit which cannot but be of great practical advantage to those who seek aid through the advantages offered by the establishment.

This institution has been conducted, practically upon this basis for now nearly twenty years, and its phenomenal growth may fairly be accepted as evidence that the idea which dominates the enterprise, and which has been briefly outlined in the foregoing, has a sound basis. Thousands of cases which have drifted about for years, and had finally been given up as incurable, have been restored to health by a few months of health training here. The advantages of this method of treatment, especially in chronic cases, is coming to be generally recognized among physicians. This is clearly shown by the fact that a lage share of the patients treated in the institution at the present time, are either sent by physicians or come with their full concurrence and encouragement.

INTERESTING CASE OF RUDIMENTARY UTERUS, OVARIES, AND ATRESIA VAGINÆ.

THE patient was an American woman aged forty-six years, had been married twenty-two years, was well developed physically, a woman of average intelligence and good personal appearance. She was brought to me by her husband for examination with reference to a possible operation for relief of her condition. On examination, I found the vagina to be entirely absent. The external genitals were fully and normally developed in every respect, but at the

usual seat of the ostium vaginæ I found only two small pouches about half an inch deep

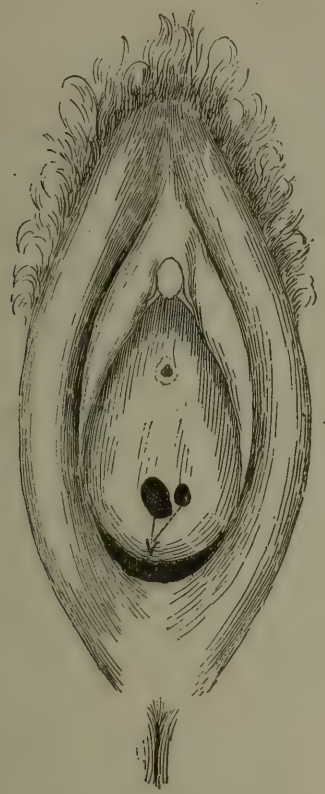


FIG. 1. SHOWING RUDIMENTARY VAGINÆ AT V.

and separated by a thin septum, looking really like a rudimentary double vagina. The most careful examination revealed no further trace of a vagina.

On examination through the rectum with a sound in the bladder, it was at once evident

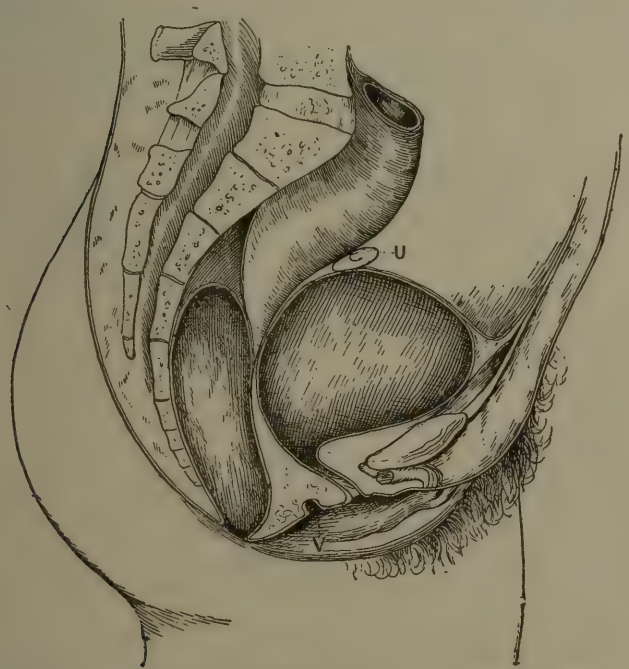


FIG. 2. SHOWING AT V THE RUDIMENTARY VAGINA, AND AT U THE RUDIMENTARY UTERUS.

that the uterus, if present at all, must be extremely rudimentary. By very careful examination, I was able to make out clearly the arching structures of the broad ligaments, and in the center, a small nodule not larger than a hazel-nut. On the left side, in the region where the left ovary should have been located, I made out a similar nodule still smaller, but found nothing more than a slight thickening of the structures in the right ovarian region.

The patient had never menstruated. At a previous examination by a gynecologist of good standing, she had been told that both the ovaries and the uterus were entirely absent. I was enabled, however, in my examination, to make out the presence of an extremely rudimentary uterus; and from the fact that the patient had developed all the external physiological characteristics of a normal woman, the breasts being well formed, and the external genitals perfectly developed in every particular, I think it impossible that the ovaries could have been entirely absent. On careful questioning, I could obtain no trace of the slightest suggestion even of a menstrual period at any time during her life, and was surprised when the patient remarked that although she had never menstruated, she had passed through the "change of life." Further questioning elicited the fact that for a few years back the patient had had "hot flushes," and the various vasomotor and other nervous disturbances usually experienced by women passing through the menopause. These symptoms had entirely disappeared within the last year or two.

Coen, of Bologna, a few years ago reported the case of a girl born at the end of the eighth month of gestation in whom there was absence of both uterus and vagina. In this case, both kidneys were also absent, although the ovaries and fallopian tubes were present.

A case similar to the present one was reported to the New York Obstetrical Society five or six years ago. In this case, as in the one above mentioned, there were two small external pouches at the seat of the ostium vaginæ. A small pouch had been formed behind these openings in the fossa novicularis, the result of attempts at coition. No pouch of this sort existed in the case which I have reported above. The patient experienced normal sexual desire until within a few years, or at least believed that she did. The accompanying figures represent, as nearly as possible, the conditions found in this case.

Baths in Typhoid Fever.—In a recent lecture, Dr. E. J. Janeway of New York, recommends the use of cool baths in typhoid fever, beginning at 96° and cooling down to 70°. The later effects in reduction of temperature are even greater than the immediate.

REPORT OF SURGICAL WORK IN THE SANITARIUM HOSPITAL FOR FEBRUARY, 1892.

FEBRUARY 1.

Adhesions Broken Up.—Patient aged 49. Uterus retroverted, enlarged, and adherent. Constipation from mechanical obstruction. Uterus forcibly replaced by conjoined manipulation; retained by pessary. No febrile reaction.

Urethral Dilatation.—Patient aged 45. Dilated urethra; found granuloma three fourths inch from meatus; removed by curette; afterward applied pure carbolic acid. Cured.

Ovariotomy — Shortening of Round Ligaments.—Patient aged 26. Had been an invalid for many years, from ovarian disease; uterus retroverted; shortened ligaments. Made median incision 1½ inches; broke up adhesions of uterus; found both appendages badly diseased. Ovaries cirrhotic, adherent; removed appendages. Good recovery.

Removal of Polypus of Rectum.—Patient aged 37; had suffered for months from irritation of rectum; occasional hemorrhage. Found tumor of the size of a filbert at the base of the posterior wall, an inch and a half from orifice; removed by Dr. Kellogg's rectal hemorrhoid snare and Paquelin cautery.

Varicocele.—Removed a section of about two inches of the mass of enlarged veins; ligated the ends and placed them between the lips of the external incision, which was closed with deep sutures. Recovery without febrile reaction.

Rectal Fissure.—Patient aged 24; had suffered several weeks from fissure of the rectum resulting from constipation. Dilated the sphincter with bivalve speculum. Recovery complete.

Forcible Replacement of Uterus.—Patient aged 26. Retroversion for a number of years; uterus had never been replaced; could not be restored by manipulation. Uterus was lifted to its position by conjoined manipulation under anæsthesia, considerable force being required. Pessary placed; no febrile reaction.

Curetting Uterus — Removal of Synovial Bursæ.—Patient aged 32; had been suffering from persistent menorrhagia for some months. Had several synovial bursæ on back of each hand; removed vegetations by curetting; dissected out bursæ; closed the wound with sutures. Recovery. One bursæ which was not completely removed, returned.

FEBRUARY 7.

Curettage of Uterus.—Patient aged 37; menstrual flow profuse and very frequent; uterus measured 3½ inches; removed vegetations with curette; irrigated with hot bi-chloride solution. Good recovery.

Circumcision.—Patient aged 6; insomnia; nervous and irritable; complete phymosis; slit foreskin and united by half dozen sutures. In three weeks the patient had remarkably improved physically; good appetite; sleeping well; nervousness and irritability disappeared.

Shortening of Round Ligaments.—Patient aged 34. Retroversion for many years; profuse menstruation. Curetted; shortened ligaments by Dr. Kellogg's method. Good recovery.

Fibrous Tumor of Face.—Patient aged 38. Fibrous tumor of moderate size overlying the malar bone. Had developed after a carbuncle from which patient suffered a number of years ago. Excision. Recovery.

Vaginal Fistula.—Patient aged 33. Fistula resulted from an abscess in the right labia 20 years previous. External orifice nearly 2 inches from the inner border of the vulva; fistula about 3 inches in length. This was curetted and afterward washed with peroxide of hydrogen. Did not heal completely. Subsequent excision required.

FEBRUARY 11.

Epithelioma of Cervix—Curettage.—Patient aged 61; sent by Dr. Hamilton. Found epithelioma of cervix which had invaded the vaginal tissue for a considerable distance on each side, also the broad ligaments. Disease too far advanced to admit of a radical operation. Cut away as much as possible of the diseased tissue with scissors and curette. Dressed antiseptically; patient was able to return home in a few days.

Fibroma of Mamma.—Patient aged 49; suffering from tumor of breast; began some years ago, but did not increase in size until a few months ago, after a second injury; since then, had been growing rapidly and had attained the size of an egg. Very painful; found tumor completely encysted; easily removed; wound closed with deep sutures, and healed by immediate union. Examination of tumor showed it to be a fibroma.

Amputation of Cervix — Excision of Labial Cyst.—Patient aged 46. Presented a very long conical cervix uteri; a troublesome labial cyst, due to obstruction of the duct of Bartolin's gland. Amputated the cervix; closed wound by sutures; excised the cyst and Bartolin's gland. Operation completed with little hemorrhage. Immediate union.

Ovariotomy.—Patient aged 46. Had suffered for many years from ovarian disease; had found no relief by treatment. Median incision 2

inches; found both ovaries enlarged and cirrhotic; large hæmatocele in right ovary. Removed both appendages; time, 20 minutes. Good recovery.

Small Uterine Polypus — Curettage.— Patient aged 42; menorrhagia. Patient had suffered for some time from menorrhagia. Examination disclosed a small uterine polypus; removed by scissors, and cauterized base; curetted uterus. No febrile reaction.

Curettage — Shortining Ligaments for Retroflexion.— Patient aged 40; unmarried, had had suffered for many years from retroversion and retroflexion; menorrhagia. Dilated and straightened uterus; removed vegetations by dull curette; introduced Dr. Kellogg's self-retaining stemy pessary and shortened each ligament 3½ inches. Time, 20 minutes.

Trachelorrhaphy — Perineorrhaphy — Curettage.— Patient aged 26; had suffered from metrorrhagia and other troubles resulting from laceration of the cervix uteri and perineum for a number of years. Depth of uterus, 3¾ inches. Removed vegetations with dull curette; repaired cervix after Emmet's method; repaired perineum by Tait's method. Time of perineorrhaphy 2½ minutes; of the three operations, 25 minutes. Good recovery.

FEBRUARY 18.

Shortening of Ligaments—Perineorrhaphy.— Patient aged 30; retroversion; laceration of perineum; rectocele. Shortened ligaments 4½ inches; each repaired perineum by Tait's method, using 4 sutures. Time of perineorrhaphy, 4 minutes.

Shortening Ligaments.— Patient aged 39; retroversion of many years' standing; had suffered from pressure of rectum on the uterus for many years; not benefited by pessaries. Shortened ligaments 3 inches each; time, 20 minutes. Good recovery.

Ovariotomy.— Patient aged 35; had suffered from ovarian trouble for 13 years; had been in bed much of the time; recently her mind had become disturbed. Incision 2 inches; found double pyo-salpinx; appendages removed. Good recovery.

Epithelioma of Cervix Uteri Curettage.— Patient aged 44; cervix uteri nearly gone; vaginal tissues invaded on one side; disease evidently extending to rectum. Curetted thoroughly, and applied chromic acid, as the disease was too far advanced to admit of radical treatment.

Hemorrhoids — Case 1.— Patient aged 27, was almost completely helpless from suffering

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NON-TOXIC.
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FORMULA.— Listerine is the essential antiseptic constituent of Thyme, Eucalyptus Baptisia, Gaultheria, and Mentha, Arvensis, in combination. Each fluid drachm also contains two grains of refined and purified Benzo-boracic Acid.

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LISTERINE is a well-proven antiseptic agent — an antizymotic — especially useful in the management of catarrhal conditions of the mucous membrane; adapted to internal use, and to make and maintain surgical cleanliness — asepsis — in the treatment of all parts of the human body, whether by spray, irrigation, atomization, or simple local application, and therefore characterized by its particular adaptability to the field of

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and loss of blood occasioned by the presence of a large number of bleeding hemorrhoids; removed with Dr. Kellogg's rectal hemorrhoidal snare and Paquelin's cautery. Time, 10 min.

Case 2.—Patient aged 30; a small but very painful hemorrhoid on posterior wall of rectum; removed by snare and cautery.

Ovariotomy.—Patient aged 27; had suffered many years from ovarian disease; had been in a hospital once before for operation, but her courage failed, and she left. Found cirrhotic and cystic condition of both ovaries; hæmatocele in right ovary. Removed appendages; good recovery.

Shortening Ligaments.—Patient aged 26; had suffered from retroversion for many years; tenderness of left ovary. Shortened ligaments 4 inches; ovaries and uterus both restored to position. Good recovery.

Ovariotomy.—Patient aged 27; had not been well since miscarriage, four years ago; had been under treatment without relief. Had been in hospital for several months, but practically no better; both ovaries cystic and cirrhotic; hæmatocele in right ovary; both ovaries and tubes adherent. Removed both appendages. Good recovery.

FEBRUARY 23.

Varicocele.—Patient aged 28. Had suffered great pain from varicocele for several years. Removed section of large veins securing the ends by silver wire, Aveling's coils and shot; closed the wound with deep sutures; immediate union; good recovery, without febrile reaction. Wires removed on fourth day.

Ovariotomy—Shortening Round Ligaments.—Patient aged 38; had had ovarian disease for a number of years; not relieved by previous treatment in sanitariums and elsewhere subsequently; constantly getting worse; uterus retroverted; shortened ligaments 4 inches and removed appendages. Good recovery.

Shortening Ligaments.—Patient aged 33; retroversion for 13 years, which varied and long-continued treatment failed to cure. Ligaments shortened 4 inches by Dr. Kellogg's method; time, 12 minutes. Good recovery.

Nephrotomy.—Patient aged 25; sent by Dr. Hartman. Mass in region of right kidney, filling right half of abdomen; the mass was very hard, but palpitation gave a suspicion of fluctuation; median incision just above the umbilicus; internal palpation gave distinct fluctuation and showed the mass to be in the region of the right kidney and with a broad base. Abdominal incision closed. Lumbar nephrotomy performed. Two quarts of pus withdrawn. No febrile reaction.

Summary.—Total number of operations in February, forty-three. A good recovery from the operation occurred in each case. No death in the Hospital during the month.

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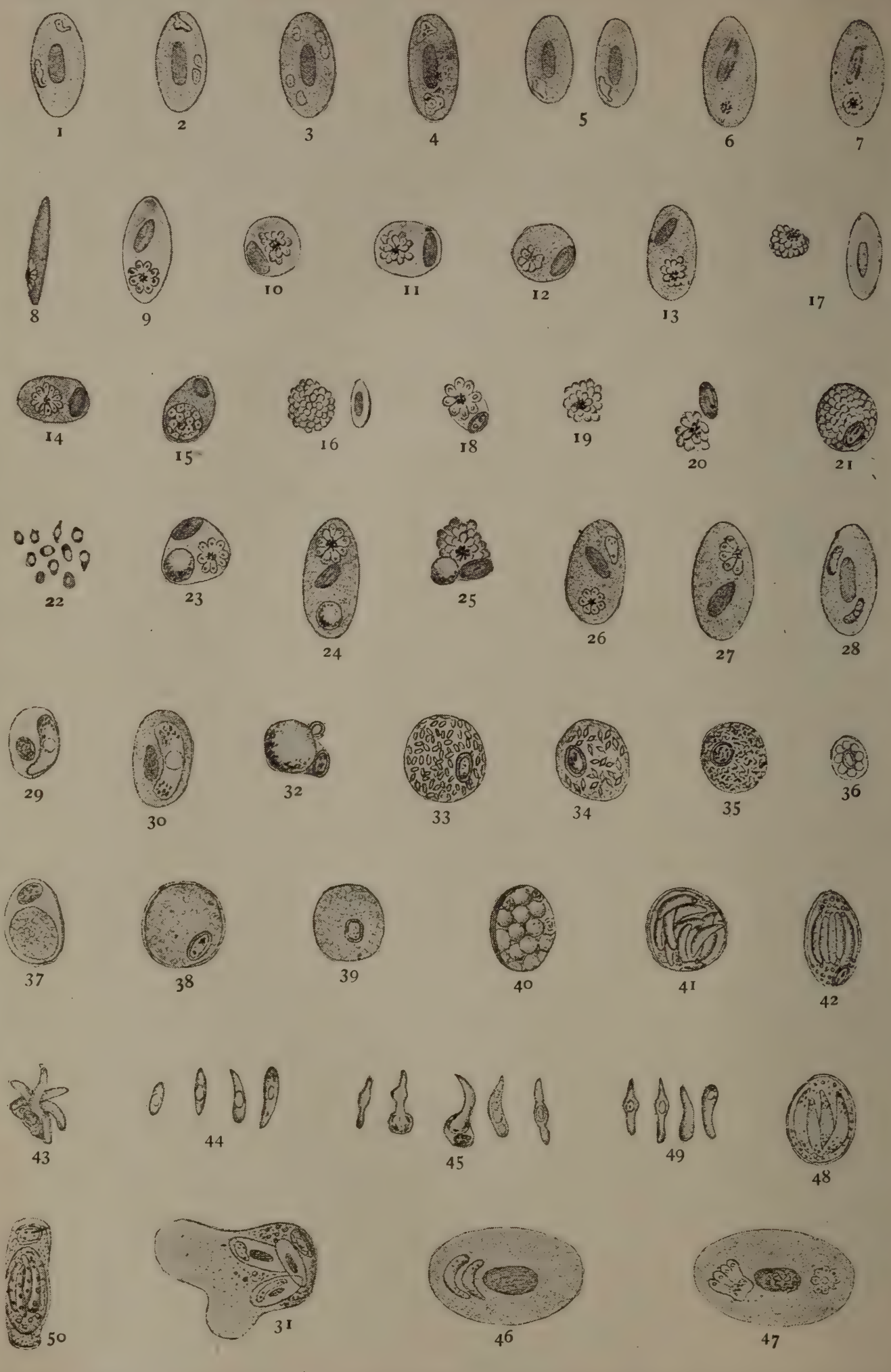
SUPERIOR to ANYTHING which has HERETOFORE been OFFERED to the PROFESSION.

The prejudice which has existed against vaccination, especially among the ignorant classes, although not by any means wholly confined to this class, has found its foundation in the disastrous results occasionally following vaccination, which afford unmistakable evidence of blood poisoning, and of the presence in the vaccine of SOMETHING, the introduction of which into the human system could not be regarded otherwise than most undesirable.

The bacteriological studies of vaccine undertaken by Prof. PAUL PAQUIN, while in charge of the Bacteriological Laboratory of the State University of Missouri, and State Sanitary Veterinarian of that State, as well as those which Dr. Paquin has conducted since becoming Director of the Sanitarium Laboratory of Hygiene, have shown most conclusively that the "something" which works "not wisely but too well," not infrequently as the result of vaccination, is not the vaccine virus proper, but is a morbid and foreign element consisting of various pathological germs, some of which are capable of producing, under favorable circumstances, fatal effects, which accounts for the occasional deaths resulting from vaccination.

Prof. Paquin has demonstrated that by the exercise of vigilant care and the employment of suitable methods, vaccine may be produced which is free from these dangerous elements; and the purpose of adding to the Sanitarium Laboratory of Hygiene a department for the development of vaccine, has been to place in the hands of the profession, vaccine which can be relied upon for securing the protective influence for which it is employed, without the production of grave or unpleasant symptoms from the action of foreign germs.

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PARASITES OF MALARIA.

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BACTERIOLOGICAL WORLD

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ORIGINAL ARTICLES.

MICRO-ORGANISMS OF THE MOUTH.[1]

BY JOHN H. LINSLEY, M. D.

Prof. of Pathology and Bacteriology, Medical Department University of Vermont, Pathologist to the New York Infant Asylum, etc.

Mr. President, and Gentlemen of the Vermont State Dental Society:—

I very much regret the limited amount of time I have had in which properly to conduct many practical researches into some of the surprisingly numerous varieties of micro-organisms which either find their habitat in the oral cavity, or are simply resting strangers, or *loungers*, as I might say, in this locality.

While I shall exhibit to you some flourishing so-called pure cultures of bacteria, whose ancestors were removed from carious teeth, inflamed gums, and improperly cleansed "grinders," I have, necessarily, been obliged to resort to the latest text-book[2] on the subject, and to the various papers and articles which have recently appeared in medical and dental periodicals, both domestic and foreign, for the recognized varieties of germs infesting the mouth, their relatively respective frequency, etc.

It is an interesting fact in the history of bacteriology, that the first authenticated record and drawings of bacteria were made from micro-organisms discovered in mucus from the human mouth, by Leewenhoek, in 1683. From this time until about 1860, but little progress was made in this subject, and the rapid strides and the accumulation of important data accomplished in recent years, have been very largely due to the improvement and perfecting of optical instruments. The fortunate discovery by Koch of the use of artificial, solid, transparent food-media, was of scarcely secondary importance in the development of bacteriology, by facilitating the separation, culture, and examination of germs.

A brief description of the more common culture-media used for separating and growing organisms of the mouth, together with the methods employed in obtaining pure cultures, will be of interest to those of you who are unfamiliar with the details of bacteriological investigations.

Nutrient Gelatine.— This is composed of beef-juice, or beef-extract, to which is added from 5 per cent to 20 per cent of best French gelatine, $\frac{1}{10}$ per cent dried peptone, and $\frac{1}{20}$ per cent common salt. The reaction must be neutral, or very slightly alkaline. The addition of 1 to 2 per cent sugar improves the medium for the growth of mouth bacteria.

This material is easily prepared,[1] and is largely employed, especially for plate or dish cultures. It is unfit for use in the incubator, as the gelatine is liquefied at a temperature above 25° C. The characteristic growth of many bacteria is better exhibited on this substance than on the following:—

Nutrient Agar-Agar.— This is prepared[2] similarly to the foregoing, only that 1 per cent to 2 per cent of agar-agar is used, instead of the 5 per cent to 20 per cent of gelatine. (For detailed directions for the preparation of these media, reference to the text-books on bacteriology is advised.)

Boiled Potato.— This is a very simple and valuable nutrient medium. Any sound potato can be used, excepting those which crack open, or become

[1] Paper read before the annual meeting of the Vermont State Dental Society at Burlington, Vt., March 17, 1892.

[2] "Micro-Organisms of the Human Mouth," Miller.

[1] This can be obtained already prepared of Eimer and Amend, 205 etc. Third ave., N. Y.

[2] This can also be bought of the same firm.

mealy on boiling. The potato is carefully washed and scrubbed with a stiff brush (an ordinary nailbrush answers very well), and the "eyes" and any unsound portions removed; it is then soaked for one hour in a 1–1000 bichloride of mercury solution, and finally boiled in a steam sterilizer, or cooking steamer, for one half or three quarters of an hour. It is then placed in a moist-chamber, or covered glass dish, which has been sterilized, and in the bottom of which has been placed a piece of filter, or blotting paper, slightly moistened with 1–2000 bichloride solution.

If the proper precautions have been observed in their preparation, potatoes thus treated will remain germ-free indefinitely, and can be used any time at a moment's notice for the planting of material from which cultures are desired. Many bacteria exhibit their most characteristic growth on this medium, and but few germs are known which refuse to exist upon it.

Occasionally a micro-organism is met with which requires for its full development, a different soil from any of the three media just enumerated. In such cases other substances are used, such as sterilized blood-serum, starch-paste, boiled hen's egg, etc.

Liquid media are also employed in the cultivation of micro-organisms generally, as well as those from the mouth, but more especially for studying the progress and phenomena of putrefaction, fermentation, decomposition, etc., occasioned by the action of bacteria. Such media are bread-juice, peptonized beef-bouillon (to which has been added 2 per cent of sugar, with occasionally the addition of starch), urine, milk, watery extracts of various plants or grains, juice of fruits, saliva (to which some nutritious substance has been added), etc.

Pure cultures are obtained by transferring a minute quantity of a colony from a glass plate, or Petri dish, on the end of a sterilized platinum needle, to a tube of nutrient medium, where it is planted by either thrusting the needle directly through the middle of the solidified culture medium in a test-tube, then twisting the needle a few times between the thumb and fingers, and carefully withdrawing same (the so-called "thrust," "puncture," or "stab" culture); or by drawing the point of the impregnated platinum needle, which has been slightly bent, across the surface of the medium, which has been allowed to solidify in the tube in an oblique direction (the so-called "scratch," or "surface" culture).

Considerable work and investigation in this line, can be done by the practicing dentist or physician, without investing in an expensive outfit. At least it is quite practicable for any practitioner who desires to determine the existence of any particular species of micro-organism in certain cases, to himself inoculate a prepared tube of gelatine, or agar, with the suspected material, and send the same immediately to a bacteriologist for further treatment, examination, etc. The following is a procedure I have employed in the investigations of this subject, and is, as you will admit, exceedingly simple and quite satisfactory: I use the glass phials of various sizes used by some wholesale drug houses for holding physicians' samples of pills, parvules, tablets, etc. These phials are sterilized, filled for from 1 to 2 ctm. with sterilized gelatine, or agar, and their mouths closed with the ordinary cotton-wool plugs.

When a patient comes under treatment having a lesion of the mouth, teeth, or gums, the bacteria of which it is desired to cultivate, the dentist sterilizes an excavator, by passing it back and forth through the flame of his spirit lamp or Bunsen burner, a few times, and carefully removes a bit of material from the mouth, and pushes it just into the gelatine in the prepared bottle. The same day, at the first opportunity, this is sent to me, and dish-cultures, etc., are subsequently made from the specimen.

To review all the varieties of bacteria which have thus far been described and obtained (over 100 species) from the buccal cavity, with their individual peculiarities, etc., would require several papers, each fully as long as the present one.

I shall therefore confine myself to the consideration of a few of the more prominent and frequently occurring varieties, and afterward offer some comments, applicable, in a general way, to the subject.

It has been customary for many observers to classify every thread-producing germ which they find in the buccal cavity, as leptothrix buccalis. This is to be deprecated, as there are several bac-

teria of the mouth which form threads.

The name leptothrix buccalis (like bacterium termo) designates no particular organism possessing peculiar characteristics, and the name no more deserves to be retained than "denticola," "Buhlmann's fibers," etc. ; the less so since it has always been the expression for an obscure and erroneous conception.

Morphologically, as well as physiologically considered, leptothrix buccalis has been regarded as a veritable wonder. It has been said to perforate and split up teeth, its elements to cause all kinds of diseases in the buccal cavity, to penetrate into the lungs, the stomach, and other parts of the body, and everywhere to manifest a destructive influence.

As absolutely nothing was known concerning the biology and pathogenesis of this organism, all sorts of wonderful properties were ascribed to it. It is therefore high time to banish this confusing name from bacteriological writings (Miller).

Miller suggests the name of leptothrix innominata for those germs of thread-like growth, whose biology is too illy understood to place their relation to other bacteria of the mouth.

Let us, for a moment, consider what the inducements are which the mouth, as a whole, offers to wandering, homeless "bugs," that they so readily and promptly enter these premises, and not only obtain their own individual livelihood, but unceremoniously at once proceed to increase the members of their households. As pertinently stated by one observer,[1] the mouth forms "a kind of hot-house, or forcing-ground, for their cultivation." Dr. Bergtold[2] says: "If one could find a perfectly sterile mouth, he could also see at once that the opportunities for seeding it, so to speak, are excellent, in that every individual is more or less constantly taking in air and also food and drink through that channel, and in both these actions there are received numberless spores and other forms which, later, give us growths of bacteria.

The organic and inorganic substances found in the mouth, are the following: 1. Normal saliva; 2. Buccal mucus; 3. Dead epithelium; 4. Dental tissue softened by acids; 5. Exposed pulps; 6. Exudations of the gums, conditioned by the irritation of tartar, etc.; 7. Accumulation of particles of food.[1]

The carbohydrates and albuminous substances furnish the greatest nutriment for bacteria, and are almost constantly in the mouth. They are found between the teeth, in cavities in the teeth, and also upon their surface, and in any depressions.

Perfectly pure, mixed, human saliva has no toxic properties, and in those cases which have been reported by Pasteur, Valpian, Gautier, and others, in which "unadulterated human saliva caused more or less morbid phenomena," it must be suspected that the samples used were, in some manner, contaminated.

Mixed with the various deposits of bacteria, etc., always present in the mouth, saliva may possess most energetic toxic properties, having many times proved fatal even, as is abundantly demonstrated by numerous recorded cases.

It is also probable that the saliva has far less antiseptic properties than is often ascribed to it, and the undisturbed growth of micro-organisms in the buccal cavity would seem to sufficiently support this view.

The diastatic action of the ptyalin of the saliva changes starch into a variety of sugar, variously termed dextrose, maltose, or ptyalose, which, as soon as formed, produces an excellent culture medium for those germs concerned in the process of fermentation.

According to Miller[2] there are six different micro-organisms which are almost invariably present in every mouth. They are: —

1. Leptothrix Innominata. — This occurs as thin, more or less zigzag threads. Found in the soft white deposit on teeth in every mouth. Is stained faint yellow by a solution of iodine in iodide of potassium solution, slightly acidulated with lactic acid.

2. Bacillus Buccalis Maximus.—Occurs as isolated bacilli, or threads, more often as "tufts of threads." Is the largest of mouth bacteria. Is stained brownish-blue more or less deeply, with the iodine solution.

3. Leptothrix Buccalis Maxima. — This occurs as long, thick, straight, or curved

[1] Woodhead, "Bacteria and their Products," p. 337.

[2] "The Mouth as a Center of Infection," W. H. Bergtold, M. D., Dental Cosmos, Vol. 43, No. 2.

[1] "Micro-Organisms of the Human Mouth," Miller, p. 37.

[2] Idem, p. 69

filaments, somewhat similar to bacillus buccalis maximus. . . . It is found in the mucous deposit upon teeth. Is not stained by the iodine solution.

4. Jodococcus Vaginatus.— Occurs singly, or in chains of from 4 to 10 cells. Chains have a sheath, and cells appear as flat discs, or as more rounded, even squares. Occurs in all unclean mouths. Not stained with the iodine solution.

5. Spirillum Sputigenum.— This is seen as rods, curved like commas, having very active spiral movements. Found in all mouths, especially in unclean ones. Is the soft deposit on the margin of inflamed gums of dirty mouths. Stains more readily than the foregoing.

6. Spirochaete Dentium (denticola).— Found as spirals of very irregular windings and unequal thickness. It is found under the margins of the gums, when covered with a dirty deposit, and slightly inflamed, or in other words, gingivitis marginalis.

There are a great many mouth-bacteria proper, not invariably found in every mouth, which are uncultivable, and whose pathogenesis is unknown. Among them, Miller found a bacterium of enormous dimensions in the mouth of a dog suffering from pyorrhœa alveolaris, which he has called leptothrix gigantea.

There are also three or four kinds of germs from the mouth which give a blue or violet reaction with iodine, and from 20 to 40 varieties which are cultivable, partly non-pathogenic, partly of unknown pathogenesis. The buccal cavity is a favorite locality for many varieties of chromogenic, or color-producing bacteria. These are widely diffused in nature, and occur abundantly in water, in the air, and in various places.

In the mouth they are less numerous than the colorless germs, and probably on account of this preponderance the color is not visible when in this locality, but is readily developed during the culture of these micro-organisms on many of our culture media.

Among the colors produced by different species of mouth bacteria, Miller gives a *yellow* produced by at least eight kinds of bacteria; *green*, by five; *red* or reddish, by three; *blue*, *brown*, *orange*, *black*, etc.

To study any of the bacteria microscopically, particles of matter containing them must be taken from the mouth and mounted directly on cover-glasses, after which they may be examined fresh and unstained; or (after being carried through the flame of a Bunsen burner or spirit lamp three times) be stained and mounted permanently.

Many of the germs found in the buccal cavity are, of course, accidentally present, having been deposited just previous to an examination, and would remain only a short period.

The micro-organisms I have just mentioned as being termed mouth-bacteria proper by Miller, are found in all healthy conditions of this cavity, but the variety and number are more or less greatly augmented when any morbid condition whatever occurs, such as inflamed gums, wounds, etc., of the mucous membrane of the mouth, dental caries, ulcerations, etc. Of these, Miller found by inoculation experiments on mice, rabbits, and guinea-pigs, many germs, the inoculation with which produced either death or a pathological condition of the animals thus treated.

These he calls "Pathogenic mouth bacteria." Of the varieties separated, the following were studied more in detail: —

1. Micrococcus gingivæ pyogenes.
2. Bacterium gingivæ pyogenes.
3. Bacillus dentalis viridans.
4. Bacillus pulpæ pyogenes.

The first of these micro-organisms, (Mic. ging. pyog.) was found several times in a case of pyorrhœa alveolaris, in the deposit around the teeth of a very filthy mouth.

The second (Bact. ging. pyog.) was found in the same mouth as the foregoing, and also in a suppurating tooth-pulp of a second person.

Bact. dent. virid., the third variety, was found in the superficial layers of carious dentine. In cultivation upon gelatine, this bacterium produces a beautiful opalescent green coloring matter, which it imparts to the gelatine.

The fourth bacterium (Bacil. pulp. pyog.) was found in a gangrenous tooth-pulp. The inoculating material used, was pure cultures of the different germs, mixed cultures, and gangrenous pulps, and the inoculations were made into pockets beneath the skin of the animals, and by subcutaneous injections, and injections into the abdominal and thoracic cavities.

The pockets were made as usual, at

the root of the tail, and the injections with sterilized syringes.

Before giving the results of these inoculations, let us see what are the conditions necessary to be fulfilled, in order to establish unrefutable proof of the pathogenic nature of any given bacterium. According to Koch, a micro-organism must comply with the following requisitions, before its pathogenic character is determined,— the so-called "Koch's laws," or "rules."

First. It must be proved to be present in all cases of the disease in question.

Second. It must, further, be present in this disease and in no other, since, otherwise, it could not produce a special definite action.

Third. A specific micro-organism must occur in such quantities, and be so distributed within the tissues, that all the symptoms of the disease may be clearly attributable to it.

Fourth. After removal from the body of an affected animal, and its growth in pure culture, the inoculation of the latter into susceptible animals, must produce the disease in question.

Miller's operations were followed by redness and swelling, abscesses, suppuration and gangrene of adjacent tissues, blood poisoning, and in many cases by death from septicæmia, peritonitis, pleuritis, etc. Inoculations with mixed cultures proved more dangerous than when pure cultures were used, and still more effective when gangrenous pulps were used, than with mixed cultures.

The diseases caused by the pathogenic bacteria of the mouth, Miller considers under six heads, according to the point of entrance of the infection: 1. Infections caused by a breach in the continuity of the mucous membrane, brought about by mechanical injuries (wounds, extractions, etc.). These lead either to local or general disturbances. 2. Infections through the medium of gangrenous tooth-pulps. These usually lead to the formation of abscesses at the point of infection (abscessus apicalis), but also sometimes to secondary septicæmia and pyæmia, with fatal termination. 3. Disturbances conditioned by the resorption of poisonous waste products formed by bacteria. 4. Pulmonary diseases caused by the inspiration of particles of slime, small pieces of tartar, etc., containing bacteria. 5. Excessive fermentative processes, and other complaints of the digestive tract, caused by the continual swallowing of microbes and their poisonous products. 6. Infections of the intact soft tissues of the buccal and pharyngeal cavities, whose power of resistance has been impaired by debilitating diseases, mechanical irritations, etc. 7. Possible infections by the accumulations of the excitants of diphtheria, typhus, syphilis, tuberculosis, etc.

(To be Continued.)

LA GRIPPE.

BY PROF. SAMUEL G. DIXON, M. D., AND
R. D. HOWE, M. D.
Academy of Natural Sciences of Rineodophy, Philadelphia.

In view of the news that has been received in this country from the other side of the water regarding the micro-organism of *la grippe*, the following facts may be interesting to the medical profession: —

On the 12th day of January, 1892, we reported and exhibited to the Academy of Natural Sciences of Philadelphia, a small bacillus taken from the mucous membrane of a child's eye during the febrile stage of the influenza. On the 10th day of January, 1892, this patient was suffering with all the symptoms of the onset of this disease. On the second day the left eye took on considerable inflammation, and watered freely. Twenty-four hours later mucus formed, and the congested condition began to subside. Forty-eight hours later the right eye started in with exactly the same symptoms. As soon as the mucus formed, microscopic slides were prepared, which demonstrated numerous small bacilli, averaging one and three fourths micro-millimeters in length and about three fourths of a micro-millimeter in width.

These bacilli grew on agar-agar at a temperature of 36° C., forming small, separated, almost transparent colonies, giving the surface of the culture medium a granular appearance. They stained poorly in the carbal-fuchsin stain, after remaining in the warm oven for one hour, and lost this stain readily by passing through nitric acid, one part to three of water. We have found them in the fifth transplantation.

On the morning of the fifth day of February, 1892, we inoculated a rabbit

subcutaneously over the abdomen. That afternoon the temperature of the animal rose to 103⅕° F., and it seemed sick, dumpish, and refused to move unless forced to do so. The day following, the symptoms were as follows: The temperature rose to 104⅕°, nose and mouth were very dry, eyes suffused and congested, and a watery discharge from the left eye. The rabbit would not move without considerable forcing, and absolutely refused all food.

Upon staining and examining the discharge from the left eye, the small bacilli were found. The next day the temperature rose to 103°, and the symptoms were much the same as the day before. Mucus was found in the eyes, from which we grew on agar-agar bacilli similar in size and appearance to those found in the child's eye. On the fifth day the animal recovered.

On the 9th day of February, 1892, a second rabbit was inoculated in the same manner, with practically the same results. The temperature in this experiment ran as high as 105⅖° F., and remained much higher than the preceding for two days, with rapid fall of temperature and recovery on the fourth day.

A number of specimens taken from patients suffering from *la grippe*, and sent to the laboratory by Dr. J. W. Wilson and Morris Longstreth, have enabled us to demonstrate a bacillus which corresponds morphologically with that found in the mucus from the child's eye.

We have examined the mucus from several cases which we supposed to be ordinary colds, occurring during this winter's visitation of *la grippe*, but have entirely failed to find a like bacillus. These results would therefore lead us to believe that the micro-organism above superficially described, is very closely and specially associated with our winter scourge and enemy, *la grippe*.

THE ATTENUATION OF VIRULENT MICRO-ORGANISMS.

BY PROF F. G. NOVY, M. D.
Ann Arbor, Mich.

(Concluded.)

Albumin in Normal Urine.— The question of the existence of a physiological albuminuria has been freely discussed in recent years. The existence of such a condition has been affirmed from the theoretical standpoint by Senator, and has apparently received experimental confirmation at the hands of Posner. No less an authority than Leube, however, denies that albumin is a necessary constituent of urine, and in this he is supported by the careful and pains-taking research of H. Winternitz. Very minute quantities of albumin, less than .002 per cent, can be detected by the following method: To 150 c.c. of the urine, add three times that volume of alcohol, and set aside for twenty-four to forty-eight hours; receive the precipitate on a small filter, carefully wash with water, and then treat with dilute acetic acid. The acetic acid solution is treated with a few drops of potassium ferrocyanide, and the precipitate removed by filtration. By means of a glass rod, transfer a small portion of the precipitate into Millon's reagent, and heat. Another portion may be dissolved in sodium hydrate and treated with copper sulphate (biuret). A modification of this method can be used to detect in the urine the presence of peptone arising from the absorption of pus in deep-seated abscesses.

Hæmato-porphyrin in the Urine.— Three specimens of urine having a peculiar dark red color, developed especially on standing, were examined by Salkowski (*Zeitschr. f. Physiol. Chem. 15, 286*), and shown to be due to hæmato-porphyrin. A few similar instances have been reported by Neusser (1881), Stokvis (1889), and Ranking and Pardington (1890). For clinical purposes the following method is best adapted for its detection. About 30 c.c. of the urine are completely precipitated with alkaline barium chloride solution (a mixture of equal volumes of cold saturated barium hydrate solution and barium chloride solution, 1–10); the precipitate is washed with water, then with absolute alcohol. The moist precipitate is placed in a small dish, 6–8 drops of hydrochloric acid and about as much alcohol added, the mass then rubbed up into a thin paste, allowed to stand for some time, or warmed gently on the water bath and filtered through a dry filter. If the filtrate is small, a little alcohol may be used to wash the residue, but not more than 8–10 c.c. should be used. If hæmato-porphyrin is present, the alcoholic extract is colored red, and will show the two characteristic absorption bands of hæmato-porphyrin in

acid solution. If rendered alkaline with ammonia, it takes on a yellowish tint, and shows the four absorption bands of hæmato-porphyrin in alkaline solution.

The clinical significance of hæmato-porphyrin would seem to be of considerable importance irrespective as to whether the substance normally gives rise to hæmoglobin, or is the result of decomposition in the liver of hæmoglobin. In either case a large amount of blood coloring matter is withdrawn from the system. Thus far it has been observed only in women, and of the six cases reported three ended fatally. It is worthy of note that the three patients examined by Salkowski were using sulphonal, and that when this was withdrawn the urine assumed its natural color, and that where in one case sulphonal was again given, the urine again became colored dark. Sulphonal was also used in Stokvis's case, while in that of Ranking and Pardington acetanilid was employed. An idiosyncrasy with respect to sulphonal would seem to exist in these cases. It is quite probable that hæmato-porphyrin is capable of producing marked deleterious action in man, although in animals it is toxic only in very large doses.

Occurrence of Mucoid Substances in Ascitic Fluids. — Two substances have been recently described by Hammarston (*Zeitschr. f. Physiol. Chem. 15, 202*), and inasmuch as they are not necessarily identical with pseudo-mucin or its decomposition products, he designates these as mucoid substances. One of these, mucoid, is precipitable by acetic acid; the other is mucin-albumose. Undoubtedly the parablumin of Hilger, Gusseron, and others is a mixture of mucoid, or pseudo-mucin, and albumin. The mucoid, in the dry condition, forms a fine, grayish white powder which is not soluble in water; but it can be dissolved to a neutral or slightly acid solution by the addition of a minimal quantity of alkali. The solution does not become cloudy on boiling. It is precipitated by alcohol or acetic acid, but not if sodium acetate is present. It gives the color reactions of proteids: Millon, Adam hie wicz, Xanthoproteic, and biuret. Trommer's reagent (alkaline cupric oxide solution) is not reduced on boiling; if, however, the solution is previously heated on the water bath for half an hour, with 2 per cent hydrochloric acid, it reduces copper energetically. The mucin albumose in the dry state forms a very fine, pure white powder, very readily soluble in water. The solution is not affected by boiling; is not precipitated by acetic acid or by saturation with sodium chloride, is precipitated by saturation with ammonium sulphate, also by alcohol. It shows the same behavior with the proteid tests and Trommer's solution as mucoid. Elementary analysis gave the following results: —

MUCOID.

Carbon	51.4
Hydrogen	6.8
Nitrogen	13.01, 13.1, 12.4

MUCIN-ALBUMOSE.

Carbon	49.79, 49.87
Hydrogen	6.96, 6.88
Nitrogen,	11.42, 11.4, 10.8, 11.37

The significance of these mucoid bodies in ascitic fluids is unknown.

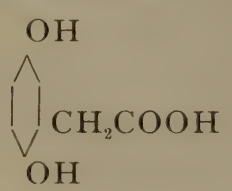
The following analyses of ascitic fluids, from three distinct cases, are of interest:

	Case No. 1.	Case No. 2.	Case No. 3.
Specific gravity	1.0125	1.0092	1.0121
Water	96.8470	97.654	96.830
Proteids { Globulin	0.6120	0.314	1.445
Proteids { Albumin	1.3050	0.795	0.802
Mucoid substances	0.1180	0.101	0.034
Soluble salts	0.8305		0.630
Insoluble salts	0.0362	0.825	0.040
Extractives	0.2513	0.311	0.219
Totals	100.000	100.000	100.000
Reducing substances calculated as glucose	0.0430	0.0768	0.030

Alkaptonuria. — In 1859 Bödeker isolated from the urine of a diabetic patient a substance, which, while it reduced Fehling's solution, did not undergo fermentation in the presence of yeast, and moreover in alkaline solution absorbed oxygen, the solution becoming colored brown to black. This substance was designated as alkapton. The later investigations of Ebstein and Müller, Fleischer, and especially Frübringer (1875), seemed to show that alkapton was identical with pyrocatechin, and expressions to that effect are to be found in most of the works on urine analysis. Of recent years it has been shown that other substances than pyrocatechin may exist in the urine, and impart the characteristics of alkapton.

Thus, Smith (1882) obtained a compound which he regarded as protocatechine acid. Barton Brune (1886), using the same method, obtained a crystalline acid which was not identical with protocatechine acid. Marshall (1887) isolated a substance of similar properties and named it glycosuric acid. The investigations of Kirk are especially interesting. In 1886 he succeeded in obtaining an acid, urrhodinic acid, which his more recent work (1889) has shown to be a mixture of at least two substances — urolencinic acid, $C_9H_{10}O_5$, and uroxanthic acid. The recent studies of Wolkow and Baumann (*Zeitschr. f. Physiol. Chem. 15, 228*) have demonstrated the existence of a true alkaptonuria; and not only have they been able to obtain this substance in a pure condition, but they have solved its constitution and source.

The urine which served them for study was obtained from a man 67 years of age in whom a short time before carcinoma of the prostate developed. No relation existed between the disease and the condition of the urine, inasmuch as he had presented evidences of alkaptonuria since childhood. The urine reduced alkaline copper solution on warming, ammoniacal silver solution in the cold, but did not reduce bismuth solutions. At first the urine was amber colored, but as soon as ammoniacal fermentation set in, became brown or black. The reducing substance was isolated from the acidulated urine by extraction with ether; this solution, on evaporation, gave a reddish brown syrup, which, treated with neutral acetate of lead, formed an insoluble lead salt and this then purified. The substance was found to have the formula $C_8H_8O_4 + H_2O$. Owing to its relation to gentisinic aid, $C_6H_3(OH)_2COOH$, it was named homogentisinic acid, $C_6H_3(OH)_2CH_2COOH$. Its constitution was shown to be



It is therefore dioxyphenylacetic aid. The urolencinic acid of Kirk is a trioxyphenylacetic acid, while the glycosuric acid of Marshall is held by these authors to be a mixture of these two acids.

An inquiry into the source of homogentisinic acid showed that when tyrosin was given internally to the patient, it was excreted almost entirely as that acid. From this, and other considerations, the authors conclude that homogentisinic acid is not an intermediate product of cell metabolism, but that it arises from tyrosin in the intestinal canal by the action of micro-organisms.

Alkaptonuria is therefore due to the presence of either homogentisinic or urolencinic acids, and possibly at times to other allied compounds.

LONDON MEDICAL NEWS.

BY W. B. JONES.

M. R. C. S. Eng., L. R. C. P., Lond., Science Scholar, St. Bartholomew's Hospital.

[SPECIAL CORRESPONDENT.]

Hot and Cold Applications in Acute Pneumonia.— Dr. Goodhart, of Guy's Hospital (Guy's Hosp. Reports, 1880), has made some observations on the relative value of hot and cold applications in the treatment of acute pneumonia. He first speaks of the injurious effects, especially on children, of heavy wrappings, blankets, and hot poultices, and illustrates this by a case of a child who was suffering from acute nephritis, and on whom hot packs and hot baths were employed. When put in the packs, the temperature rose on different occasions from 2° to 5° F., and when baths at 110° F. were employed, the temperature rose from 2° to 3°. The child while in the pack was restless, respiration was disturbed, but when taken out of it, she slept calmly. On the contrary, Dr. Goodhart has seen much benefit derived from the use of ice bags and poultices applied to the chest, especially after hot poultices have been used. The temperature has been, in many cases, reduced from 3° to 5°. However, in some cases, ice seems to have been of no use, but the temperature was brought down from 4° to 7° on various occasions, by antifebrin. Dr. Goodhart has never seen any bad effects from cold applications in the adult. In children, especially in girls, from 2 to 4 years of age, however, the effect of ice applications has been detrimental. In adults, he considers ice very useful, especially when combined with brandy internally, and warmth to the feet. He quotes Dr. Lander Brunton, who

thinks that collapse may be caused by applying cold over the surface of the heart, hence the ice bag should be applied to the side and back. On the other hand, Dr. Goodhart has seen benefit derived in acute pericarditis by applying ice to the præcordia. Dr. Goodhart believes that harm may be done in the routine use of brandy and meat essences, especially in people who are unaccustomed to the use of stimulants.

Lipoma.— Mr. Jonathan Hutchinson [*Annals of Surgery*, Oct., 1891] reports the successful removal of a large diffuse lipoma of the neck. The growth was so large that the patient, a gentleman of middle age, was obliged to keep to the house and avoid all company. Mr. Hutchinson made an incision on each side of the neck, about one inch from the middle line, down to the anterior edge of the sterno-mastoid. The growth was removed with difficulty, being firmly adherent to the skin above and to the fascia beneath. A compress of spirit lotion (⅓ spirit and ⅔ rose water) was applied and the wound healed by first intention. Mr. Hutchinson attributes the rapid healing in a great measure to the use of this lotion. In a second case, there was a large growth of a similar nature about the pubes. This was successfully removed by Mr. J. Hutchinson, Jr. This patient also had a fatty growth in the neck, but it was not of large size. Three years afterward there was no return of the growth about the pubes, and under the influence of entire abstinence from beer and the use of sulphide of calcium, the growth in the neck showed a tendency to diminish, rather than to increase in size.

With respect to the arrest of hemorrhage in such operations as the above, and in excision of the breast, Mr. Hutchinson says that he has, for many years, used no other means than torsion. The same surgeon recently amputated a leg, in the case of a patient suffering from locomotor ataxia, where suppuration in the ankle joint had followed a perforating ulcer of the foot. The amputation was done through the middle of the leg by Teale's method. The wound healed, the patient was fitted with an artificial leg, and the stump bears the pressure well.

Enteric Fever and its Treatment. — Dr. Boyd, of Dublin, in the *Practitioner*, Feb., 1892, gives a paper on "Recent Modifications in our Views of Enteric Fever and its Treatment." He remarks that many specific organisms may be present in the body and remain harmless so long as the tissues with which they are in contact are healthy. Now gastro-intestinal catarrhs and "bilious" attacks are very prevalent in autumn. These catarrhs are produced by a rapid fall of temperature in the evenings after a warm mid-day. Murchison says that catarrhal diarrhœa is often present before the attack of enteric fever comes on. The baccilli probably find the glandular tissue of the intestine in a condition of derangement from the effect of the catarrh, and it becomes the center of their habitation. The entire process affecting the gland, as far as the typhoid bacillus is concerned, lasts 14 days. After this period the gland is attacked by micrococci of suppuration, producing the special symptoms and temperature after the first fortnight. Hence an antiseptic is indicated, one that first acts on the intestine and not on the stomach. Dr. Boyd uses a gaseous one, *viz.*, chlorine in an alkaline solution. In one fourth of his cases the febrile process is brought to an end on the 14th or 16th day.

Lavage for Dilatation of the Stomach.— Dr. Attfield, of St. Bartholomew's Hospital [*Practitioner*], has seen great benefit derived in chronic gastric affections from washing out the stomach. He uses an elastic covered silk stomach tube, half an inch in diameter and 30 inches long. Slipped over the end of this is an ordinary red rubber tube 40 inches long, at the end of which is a rubber funnel. He claims the following advantages, *viz.*: (1) Vomiting is entirely checked, (2) Pain decreases, (3) Appetite increases, (4) The bowels act spontaneously, and (5) The stomach is placed in the best position to recover from its dilatation.

Origin of the Infection of the Urinary Organs.— M. Achard and M. Hartman recently reported a case of acute cystitis. The patient was obliged to use a catheter in consequence of an enlarged prostate. After an accidental abrasion of the urethra, an acute febril attack occurred, in which the temperature of the patient rose to 104° F. An examination of the urine showed bacterium coli in pure culture.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE LIVER AS AN ORGAN OF ASEPSIS — CLINICAL AND THERAPEUTICAL CONSIDERATIONS.[1]

BY DUJARDIN BEAUMETZ,

Member of the Academy of Medicine, Physician to the Cochin Hospital, Paris.

Translated by J. H. Kellogg, M. D.

Gentlemen: In the preceding lesson I have shown you upon what experimental evidences we base the antiseptic functions of the liver and its action in the destruction of poisons. I wish to-day to consider the clinical and therapeutical results which flow from these physiological properties, and first let us inquire whether we have any clinical sign by which we are able to recognize when these antiseptic functions of the liver are disturbed.

While the appearance of icterus enables us to affirm that the biliary function of the liver is disturbed; while the presence of sugar in the urine indicates to us some disturbance in the glycogenic function of the liver; while, in fine, general and local signs indicate to us disturbance in the hepatic circulation, we possess no positive sign upon which to base a recognition of the normal or abnormal state of the antiseptic functions of the liver.

Some experimenters have approached this problem directly, and have sought to determine by what means one may be able to recognize the functional integrity of a hepatic cell, and they have believed they have solved the problem of the presence of urobilin in the urine. Others have adopted an indirect method, and taking as the foundation the relation between the functions of the hepatic cells and the glycogenic functions of the liver, have employed experimentally, glycosuria as a means of diagnosis.

Finally, others have approached the problem of the antisepsis of the liver by the new methods outlined by Bouchard, and his school, and they tell us that to judge of the activity of the antiseptic functions of the liver it is only necessary to examine the toxicity of the urine. Let us examine each one of these methods.

The method which is based upon the presence of urobilin in the urine is a result of the researches of Hayem, and his student, Paul Tissier. These authors maintain that the presence of urobilin in the urine is always of hepatic origin, and that it results from the morbid activity of the hepatic cells.

The detection of urobilin in the urine is extremely easy, and may be determined very quickly by examination of the urine with the spectroscope. The characteristic line of urobilin is a band which appears between the lines B and F, of Fraunhofer. In order that this band may be well observed, the following conditions of the urine must be secured: It must be freshly collected, as the urobilin undergoes modifications under the influence of oxygen; it is also necessary that it should be clear, which requires filtration; finally, it should be acid, a condition secured by the addition of a few drops of acetic acid, if required. The spectroscope is placed against a test-tube containing the urine, and the apparatus is then directed toward the sunlight, choosing, if possible, a white cloud for a background.

If it is desired to measure the quantity of urobilin by the extent of the absorption line, it is necessary to use tubes of the same dimensions, so that the thickness of the layer of liquid may always be the same.

When biliverdin exists in the urine at the same time with the urobilin, the absorption band is much larger, and neither the violet nor the blue spectrum is seen.

All these reactions are very simple, and it is sufficient to have once seen the absorption band in the urobilin to be able always to recognize its presence in the urine; the only difficulty results from the simultaneous presence of bilirubin and urobilin. You will be able, however, by a very simple process, based upon the great diffusibility of urobilin, to separate the urobilin from the bilirubin. For this it is only necessary to allow a small quantity of distilled water to fall upon the urine to be examined, drop by drop, with great care, to avoid mixture of the liquids. The urobilin will pass into the water while the bilirubin remains in the

[1] A series of lectures delivered by Prof. Dujardin Beaumetz, published in the *Bulletin General Therapeutique*, and translated expressly for this journal.

urine, and in examining first one and then the other of the liquids with the spectroscope, the urobilin may be recognized in the water.

We have now to ask ourselves if the presence of urobilin is characteristic of morbid activity of the hepatic cells. It appears that the presence of urobilin has been determined in the urine in patients affected with certain hemorrhages, particularly cerebral hemorrhages. On the other hand, in a series of researches which I have undertaken at the Hospital, but which are not yet completed, in certain cases of well-established disease of the liver, I have not found urobilin, but I believe it may be accepted that with the exception of cases of cerebral hemorrhage, when urobilin appears in the urine there is a morbid activity of the hepatic cells. The opposite cannot be absolutely affirmed since there may exist affections of the liver without the presence of urobilin. In all cases, this is a very simple experiment, to which we have recourse when a hepatic affection is suspected.

I come to the second proceeding, the employment of experimental glycosuria. As I have remarked, according to Roger, there is always a correlation between the glycogenic activity of the liver and its antiseptic functions. It is sufficient, then, to know whether the liver is properly performing its functions to enable us to know whether it is able promptly to destroy the poisons of the body. Unfortunately this clinical problem is very difficult to solve.

We know by the experiments of Colrat, Couturier, Lepine, and Robineaud, that when the liver is cirrhotic, if glucose is introduced into the system, it appears in the urine. Unhappily, this experiment, which I have often repeated, is far from giving positive results, and in many patients suffering from cirrhosis of the liver I have not obtained glycosuria. My results are confirmative of those of Roger, who, in fourteen experiments in which glucose was administered to patients affected with various hepatic disorders, obtained positive results only in eight cases, while the results were negative in six. I shall endeavor, when I speak to you of the glycogenic functions of the liver, to demonstrate that one of the conditions of diabetes is the integrity of the liver. We shall not be able, then, to count upon this proceeding as a means of judging of the condition of the hepatic gland as a destroyer of poisons. Besides, this question of alimentary glycosuria is most complex. It should not be forgotten that, according to Bouchard, the liver throws into the blood each day 1850 grams (more than four pounds) of sugar, which is burned by the system, and as this combustion is dependent upon many circumstances, such as the season of the year and the amount of activity or of repose, the quantity of sugar burned may vary considerably. I shall return to these points when I speak of the glycogenic function of the liver.

The third proceeding, as I have remarked, is based upon a study of the toxic coefficient of the urine. You are familiar with the admirable work of Bouchard and his pupils upon urinary toxicity, and the conclusions which he has drawn from a clinical and therapeutical standpoint. I will make a brief *resumè* of this subject, however, as it involves some points with which it is important to be very familiar, if one wishes to appreciate the true value of this new experimental method.

The method consists in injecting by the vein of the lobe of the ear of a rabbit a quantity of urine sufficient to cause the death of the animal. Bouchard applies the term "urotoxy" to the quantity of urine necessary to kill a kilogram of the animal. Bouchard designates by the term "urotoxic coefficient" the fraction of the urotoxy which one kilogram of a man can produce in twenty-four hours. In order to fix this subject clearly in mind, we will make one of these injections.

Here is the urine of a man who weighs 60 kilograms. This urine has been collected during 24 hours, and the amount is 1200 c.c. By injecting 50 c.c. of this urine per kilogram of the weight of the body of this rabbit, into a vein of the lobe of the animal's ear, the animal succumbs. Then 1200 c.c. would kill 24 kilograms of rabbit. Our man weighs 60 kilograms, and kills in 24 hours 24 kilograms of rabbit. We have, then, only to determine by simple proportion how much rabbit would be killed by the amount of urine manufactured by one kilogram of the man in 24 hours. We thus determine the quantity to be 400 grams; $24 \div 60 = .4$; .4 of 1 kilogram, or 1000 grams$=$400 grams.

Then the quantity of urinary poison which one kilogram of man can furnish in 24 hours, sufficient to kill 1 kilogram of living being, is in this man 50 c.c. This is very nearly the normal amount, which is about 46 c.c., but in the pathological state it oscillates between 2 and 10 c.c. One can thus define the coefficient of toxicity: it is the quantity of toxic matter which the unit of weight produces in a unit of time. In the pathological state this urotoxic coefficient produced certain variations. It is not the same during the day as during the night. During sleep, the man eliminates from 2 to 4 times less poison than during the period of cerebral activity. The urine of day and of night would not have the same toxic effects; while the urine collected during the night would produce convulsive seizures in the rabbit experimented upon, that collected during the day would not produce this symptom, but would produce, on the contrary, a narcotic state. From this a new theory of sleep has been formulated, according to which this physiological act is determined by the accumulation of toxines producing the narcotic state.

But let us apply these facts to the study of the role of the liver as a destroyer of poisons. In the numerous observations which may be found entire in the work of Roger, where the toxicity of the urine in patients affected with hepatic disease has been ascertained, we find in the great majority of cases a notable increase of the urotoxic coefficient, which would naturally be predicted, since the suppression of the physiological functions of the liver involves the suppression of its action as a destroyer of animal toxines.

This first fact once established, it is necessary fully to recognize that from a clinical point of view it can furnish only uncertain data, and that for numerous reasons: foremost of which is that such researches belong more properly to the laboratory than to the clinic; and if in consultation a physician was even able to place at the disposition of his colleagues, a patient, a laboratory, and a rabbit, many physicians would be embarrassed if it were necessary to introduce into their practice the rabbit as a diagnostic sign. Admitting even that this fact remains simply experimental, it furnishes from the standpoint of the antiseptic functions of the liver, very uncertain information; because that in the majority of diseases of the liver there are present icterus and other disturbances of the biliary secretion.

As I have remarked, the bile is much more toxic than the urine, and while it requires 45 c.c. of urine to kill one kilogram of living matter, it requires only 5 c.c. of bile to obtain that result. The bile, then, is nine times more toxic than the urine. If all the bile should pass directly into the blood, the individual would be poisoned in 8 hours, 55 minutes, while in the case of urine, death would follow only after 2 days, 6 hours, 32 minutes. So, then, according as the bile is or is not secreted, the urotoxic coefficient may vary considerably, and thus this means may lose much of its value if it is desired to employ it in a study of the antiseptic functions of the liver.

As we see, then, we may have some indications respecting the condition of the hepatic cells from the point of view of their action in the destruction of poisons, and even if these indications are not of a very precise character, they enable us, notwithstanding, in a certain measure at least, to recognize functional disturbances of the hepatic gland. I recommend especially a spectroscopic examination of the urine, which enables us to recognize the presence of urobilin, and if the result is negative, we may employ experimentally glycosuria, or may study the toxicity of the urine.

(To be continued.)

The Work of the Heart.— M. Lewy, of the Society of International Medicine, of Berlin, recently reported the results of some investigations made for the purpose of determining the amount of work done by the heart; he concludes that this is less than has generally been supposed. According to his calculations, the work accomplished by the heart is equivalent to raising its own weight 2160 times in one hour. He finds the leg muscles able to do an equal amount of work, from which he concludes that the heart muscle is not different from other muscles, as regards the amount of work which it is able to do. It must be remembered, however, that the heart works incessantly during the twenty-four hours, whereas the leg muscles are not able to sustain continued work for more than eight or ten hours daily.

STUDY OF THE GERMS OF MALARIA.

BY. PROF. B. DANILEWSKY, CHARKOFF, RUSSIA.

(See Frontispiece.)

In *Annales De L'Institut Pasteur, V, p. 758*, a long article appears by Prof. Danilewsky giving the details of experiments and observations on malaria, a comparative study of the parasite in birds and human beings. The article relates chiefly to numerous investigations carried on with birds, but greatly elucidates the question of malaria in man. At the outset the Professor insists on the discovery that birds suffer like man, not only from chronic malaria, but also from an acute affection resembling intermittent fever in man. From his observation he is of the opinion that the hematozoa connected with malaria in man and birds are, to say the least, closely connected by their resemblance, if not identical. As in man, this investigator has observed that malarial microbiosis of the blood in birds may become very severe and cause death. The destruction of red blood corpuscles occurs as in man. This phenomena causes very great anæmia, loss of appetite, exhaustion, and death. He also observes the temporary disappearance of the hematozoa and their reappearance after a time in greater quantities than before, and this, too, after the birds had been kept in a laboratory.

These cases show an analogy to those which occur in human beings suffering from malaria, apparently cured, but succumbing to a relapse away from infectious grounds or malarial districts, without having been again exposed to influences where the germs existed. These are cases which do not respond to treatment by quinine. This might be explained by the fact that at that time the germs are not amœboid, but in the crescent form of Laveran, and it has been demonstrated that quinine acts only on amœboid forms. The author insists that the ordinary hematozoa in the blood of birds is not simply a sign of symbios, but truly of a chronic infection. Besides this, he states that the birds are subject also to an acute form of the disease. In birds apparently in good health, in which the blood contains hematozoa, the red blood corpuscles are suddenly attacked. On the interior appear bright red spots formed by the cytozoa (pseudo-vacuoles). These bodies increase in size and become filled with granules of melanine. Their number is variable. In weak subjects, there is a blood corpuscle attacked among several hundreds of normal ones. In ordinary cases, the proportion is from 1 to 20 or 50; in more serious affections, it is 1 to 5 or 8. As all microbes of animal nature, living or developing themselves in the interior of cells, are usually called cytozoa, cyto-parasites, or cyto-microbes, the author proposes to give to the malaria plasmodium in man the name of cytomœba instead of the ordinary term of hœmamœba; but as in the bird the same parasite is not mobile, and is not, therefore, amœboid, he proposes to change the work to cytosporon malariæ.

It will be seen, then, that the acute and chronic forms of malaria in birds and man are attributed, by this author, to two different parasites, at least so far as their appearance is concerned; the first having the amœboid form of movement, and the second the crescent form, being non-motile (the parasite of Laveran).

The shape of these organisms, however, seems to vary greatly, according to observation, in the same individual. Sometimes the development appears in the form of a spore, and again in the form of a rose or a marguerite. At other times there are large or small spherical bodies, and again, various other forms (as may be seen in plate in frontispiece). Observations tend to prove that the chronic form in birds pertains to the period of life of the cytosporon, and in man to the cytomœba, and the chronic form corresponds to the existence of the crescent of Laveran. The author establishes the fact that the chief seat of the action of the parasite is not the blood, but begins in the generating organs of the blood, the spleen, and bone marrow. This is true in warm-blooded animals and cold-blooded animals, for investigation has also been made in frogs.

The facts related tend to prove that in both birds and man malaria exists in three forms: First, acute affection with rise of temperature and symptoms of serious disease. The microbiosis of the blood is due, in this form, to the presence of *cytosporozoa* in birds, and to *cytomœba* in man (malarial typhus of man).

Second, chronic infection without manifest fever: microbiosis by an attack of

the red blood corpuscles, by the *polimitus* and the *Laverania* in both birds and man.

Third, mixed infection; characterized by the simultaneous appearance of *amœboid* forms of acute cases and the *polimitus* of chronic cases, both occurring in birds and man.

The following is a table of explanation of the figures appearing in the frontispiece plate. It will be seen by those who have observed the parasite of malaria in man, that those of birds, frogs, and lizards, are closely related, if not identical.

EXPLANATION OF FRONTISPIECE PLATE.

Parasites of Birds. — Figs. 1, 2, 3, 4.— The smallest cytozoa in the shape of pseudo-vacuoles; Figs. 2, 3 correspond to the intensive infection.

Fig. 5.— Change of the form of the cytozoa *a* under the influence of heat of 39°, 40° centigrade, during 12 to 15 minutes.

Fig. 6.— The cytosporozoa in acute malarial infection from 1 to 2 days after the attack of the corpuscles.

Fig. 7.—The same 1 day later; the marguerite form is more marked.

Fig. 8.— Profile view.

Figs. 9, 10, 11.— Advance sporulation of the cytosporozoa; the hœmoglobin has been chased away by a weak acid.

Figs. 12, 13, 14, 15.— Diverse forms of cytosporozoa in sporulation with parts of blood corpuscle (18, 20); Fig. 18 presents the other clear form of the marguerite.

Fig. 21.— The blood corpuscles entirely filled by the spores of the cytosporozoa.

Fig. 22.— Field of ripe spores of the cytosporozoa in a blood plasma.

Figs. 23, 24, 25, 26.— Mixed infection of the corpuscles by the cytosporozoa and microbe in chronic infection.

Fig. 27.— The cytosporozoa in sporulation and in fan shape (see Fig. 47).

Figs. 28, 29, 30.— The cytozoa of the chronic infection of the nucleus visible in the living (the hematozoa of cold blooded animals).

Fig. 31.— The macrophage from the liver of a blue jay.

Fig. 32.— Spherical cytozoa of chronic infection (Laverania?). Little bodies provided apparently with double contours.

Figs. 33, 34.— Corpuscles transformed in cytocystes filled with bright fusiform bodies (spores?); in Fig. 34, outside of these bodies are some smaller, very motile.

Fig. 35.— The cytocyste of the blood in the case preceding, but without being filled with liquid, and with very fine curved bodies resembling those of chronic infection.

Fig. 36.— The rose-shaped body of a scraped kidney.

Figs. 37, 38, 39.— Psorospermose of the red corpuscles (?) opaque granulous spheres (cytocystes) of the kidney and of the bone marrow.

Fig. 40.— More advanced stage, in the form of a raspberry; beginning of segmentation.

Fig. 41.— The ulterior differentiation of germs in the form of crescent.

Fig. 42.— The cytocyste filled with germs entirely developed.

Fig. 43.— The cyst is broken and allows the exit of motile germs.

Fig. 44.— Young Laverania (hemogregarines) of the spleen.

Fig. 45.— Laverania formed under my eyes at the expense of spherical hematozoa.

Hemoparasites of the Frog.— Fig. 46.— Twin hemogregarina developed at the expense of pseud-ovacuoles.

Fig. 47.— Intracellular sporulation of an "amœboid" cytozoa in the form of "fan" or "rose."

Fig. 48.— The cyst with germs in the form of crescent taken from a kidney.

Fig. 49.— Free motile hemogregarina in the blood.

Parasites of Lizards.—Fig. 50.— The cytocyste of the blood with germs of the hemogregarina; analogous cyst may be found in the kidney and spleen. P. P.

Iodoform Injections for Goiter.— Mosetig recommends the injection of iodoform dissolved in a mixture of ether and olive oil as the best means of treating goiter, the solution being injected into the throat. He recommends the following formula: Iodoform, 1 dr.; ether, 5 drs.; olive oil aa, 7 drs. M.

Iodoform, 1 dr.; ether, 5 drs.; olive oil, 9 drs. M.

A hypodermic syringe full of either of these solutions is injected into the goiter every three to six days. Mosetig reports great improvement in all cases treated by this remedy.

Administration of Creosote by Enema.— That creosote is one of the most efficacious remedies against pulmonary phthisis thus far discovered, is coming to be generally recognized by physicians who have made a fair trial of this remedy. The principal drawback to its use has been the difficulty of introducing it in sufficient quantities without producing too much disturbance. The stomach will tolerate the remedy only in very small doses. This fact has led to the adoption of the hypodermic method, sterilized oil being used as a vehicle. A much larger quantity can be used in this way than by the stomach, and recently some French physicians have even succeeded in introducing under the skin as much as a gram a day largely diluted with oil. This method, however, is painful, and must be conducted with most scrupulous care to avoid serious accident. As a substitute for both methods, the administration of the drug by enema has been proposed and practiced successfully for more than a year. An emulsion made by mixing oil of sweet almonds and the yolk of egg has commonly been employed as a vehicle; but Chabaud and Guiter recently report the best success in the use of a watery solution of creosote. They find that pure creosote rectified from ordinary beech wood, by distillation between 200° and 212° C., dissolves in water in the proportion of 1–100, and that this solution is absorbed with great rapidity. The solubility of creosote is increased by the addition of 5 per cent of alcohol. The remedy is easily obtained, and the evidence of its prompt absorption appears in the fact that immediately after its administration, the patient recognizes the odor and taste of creosote; at the end of 10 or 15 minutes, the urine presents the brown olive coloration characteristic of creosote. The whole dose is commonly absorbed within 30 minutes after its administration. The dose at the beginning of the treatment, should be seven or eight minims, the quantity being increased as toleration is acquired. The dose is to be repeated two or three times a day, and the quantity may be gradually increased until the patient takes from 40 to 60 minims per diem.

[After closely watching the results of the remedy administered in this manner in a number of cases, we are well convinced of its efficacy, and rely upon this more than upon any other means of medication, using all other hygienic means in connection with this remedy. J. H. K.]

Nitrite of Amyl for Chloroform Poisoning.— Burral recommends the use of nitrite of amyl as a means of rallying a patient in whom dangerous symptoms have appeared. From four to ten drops of nitrite of amyl upon a folded napkin are held to the nose of the patient; if respiration has ceased, artificial respiration should be employed at the same time. The remedy acts by dilating the cerebral bloodvessels.

Lysol. — M. Paul (*Bulletin General Therapeutique*) has been investigating the composition of lysol, as the result of which, he has renounced its use. He finds the solution turbid, resembling a decoction of quinquinina. The solution is also unstable, rapidly losing its odor. He has substituted for lysol a mixture of 40 parts of crelysol, and 20 parts of medicinal soap for a quart of water. This mixture makes a very nice solution which does not change, and appears to be more active than lysol.

Toxicity of the Urine in Diseases of the Liver.— M. Surmont recently reported to the *Societie de Biologie*, the result of some experiments made upon animals with the urine of twenty different patients suffering from disease of the liver, with the following results: —

In atrophic cirrhosis the urinary toxicity is double that of the normal condition, and diminishes when the patient suffers from diarrhea. In a case of hypertrophic cirrhosis of alcoholic origin, the toxicity was sub-normal. In morbid conditions of the liver resulting from disease of the heart, the urinary toxicity is diminished, as is also in the case of the fatty liver of tuberculosis, and in cancer of the liver. The degree of urinary toxicity seems to be related to the condition of the hepatic cells. In a case of grave icterus, the degree of toxicity was below normal, but increased rapidly as the patient began to improve.

M. Roger had observed that in pneumonia the toxicity was diminished during the early part of the disease, but suddenly increased when the crisis was past.

Bacteriological Notes.

[The notes appearing in this department are abstracts or translations prepared expressly for the Bacteriological World and Modern Medicine, from original sources.]

The Flora of Butter. — Various investigators have studied the action of different pathogenic germs in butter, and M. Krueger has studied the bacteriological flora of diseased butter, but there have been but few, if any, worthy experiments made to demonstrate the quantity of micro-organisms habitually in butter. M. Lafar (*Archiv. fur Hygiene, XIII, p. 1*) has made investigations by making plate cultures from emulsions of butter, and has given us the following figures: In one gram of butter, taken at the top, he found 47,250,000 bacteria. In a similar piece, taken from the interior of the same mass of butter, the quantity was only 2,465,555. In most of his experiments, he found in butter taken one centimeter below the surface, with a sterilized knife, from 10 to 20 millions of bacteria per gram, the minimum being 6,700,111, the maximum 25,637,681. These figures, says M. Ed. de Freudenreich, in the *Annales de Micrographie, IV, p. 255*, may appear enormous, but they agree with those I have found in Emmenthal cheese, a gram of which also contained several millions of bacteria.

In seeking to demonstrate the action of cold temperature on butter, M. Lafar observes that exposure during fifteen days at the mean temperature of 9° C. lowers the number of germs only one third. When the butter is subjected to the temperature of the room, the number of bacteria augments rapidly. There were at this temperature, 6,700,111 on December 30, and 35,215, 053 on January 9. There was a decrease in the quantity of germs as the rancidity of the butter augmented. At 35°, the rancidity, and with it the diminution of the number of bacteria, was produced much more quickly. The addition of sterilized salt to butter exposed to cold temperature, decreases the number very perceptibly, but even the addition of 10 per cent of salt does not kill them all. In this case, the number declined from 25,637,681 to 215,749. It seems that all the germs except one kind are killed, and this one resisting salt at this strength is the most constant in butter. It is the *bacterium butyri colloidum.*

In artificial butter the writer has found only 847,059 micro-organisms per gram of butter, including fungi, etc., and one bacterium not liquefying gelatine. The flora of this butter, then, is quite different from that of natural butter.

A New Bacillus of Malignant Œdema. — Mr. Klein (*Centralblatt fur Bakteriologie, X, p. 186*), reports the discovery of a bacillus which produces malignant œdema similar to that produced by the septic vibrio of Pasteur. He had inoculated a guinea-pig with some earth taken from the garden, as is frequently done in experiments, and the animal perished in thirty-six hours with an inguinal œdema of the abdomen and thorax. The liquid from the œdema contained fine bacilli which resembled somewhat the vibrio of Pasteur, but their culture distinguished them from the former very positively, inasmuch as they were found to be ærobic, and they never liquefied gelatine. In the cultures, colonies are visible as early as the twenty-fourth hour, in the form of small, grayish, round points. After forty-eight hours, the colonies appear on the surface of medium as plaques, grayish in appearance, but transparent. After a few days, they have obtained their maximum of growth, that is, a diameter of several millimeters. In the same earth in which this bacillus was discovered, Mr. Klein found, also, the true vibrio of malignant œdema.

Ptomaines of Measles and Whooping-cough. — M. Griffiths reported (*La Semaine Medicale*) to the Academy of Sciences of Paris, Feb. 29, the discovery of two new ptomaines. Using the method of isolating ptomaines from cells, which he has employed several years, he obtained a ptomaine which, when administered to a cat, produced a very high fever, and death in 36 hours. He has also obtained a special ptomaine from the urine of patients suffering from whooping-cough, and by comparison, has assured himself that the same ptomaine is produced by the bacillus of Afanassieff. Neither of these ptomaines is found in normal urine, and both must be the result of the specific microbe which is the cause of the diseases named.

Alcoholism and Tuberculosis. — Hector W. G. Mackenzie, M. A., M. D., Assistant Physician to the Brompton Hospital for Consumption, gives in the *British Medical Journal* (Feb. 27, 1892) an analysis of 75 fatal cases of tuberculosis, in all of which there was a strong history of alcoholism ; in only 10 of these was there any history of phthisis in the family. In 60 per cent, the liver was cirrhotic. In 12 of these cases the patients were over 20 years of age and under 30 ; twenty-five of the cases were over 30 and under 40 ; twenty-five cases were between 40 and 50 ; seven of the cases were between 50 and 60 ; in five cases, between 60 and 70 ; and in one case the age was 73 years. The average duration of these cases was found to be much below the general average. The author states that "from the histories given by patients, and from the evidence afforded by post-mortem examinations, the conclusion has been forced upon me that tubercle is more common among the alcoholic than is generally believed. The author also adds the following very significant and important observations : —

"My experience among out-patients at the Brompton hospital, is, that a considerable proportion of the phthisical — especially of the men — have been alcoholic, and I should say that a history of alcoholism is a very common antecedent in those cases where there is no inherited susceptibility to tubercle. As regards women, it is impossible to say to what extent alcohol is responsible for the disease, it being very uncommon for a woman to own to alcoholic habits.

"In alcoholic cases the condition of the patient is generally worse than would be expected from the amount of disease revealed by physical examination. It is therefore specially important in such cases, when there are any chest symptoms, to examine the sputum for bacilli. By this means I have been able to make an early diagnosis of phthisis when the examination of the chest was negative. In alcoholic cases, I have found that the progress of the disease, as a rule, is rapid, and the prognosis particularly unfavorable.

"The belief that, as regards people of any age, alcoholic drinks in excess act as a preventive of tubercle, I consider not only not borne out by experience, but altogether contrary to it. Without post-mortem examinations, conclusions as to the absence of tubercle are fallacious and of no practical value."

Recurrent Erysipelas. — Hertz and Widal (*La Semaine Medicale*) quote cases of recurrent erysipelas, in which the disease seemed to have, as its starting-point, a patch of chronic eczema. Some blood drawn from the eczematic spot revealed the presence of tuberclereptococci which yielded pure cultures, and were highly virulent. In one of these cases, 20 recurrences of the disease occurred within three months. The patch of eczema seemed to serve not only as a point of entrance, but also as an incubating ground for the invading bacteria.

The Bactericide Substance of the Blood. — Prof. M. Ogata, of Tokio, Japan, has established, in connection with Mr. Iashuhara, that mice can be rendered immune against charbon by the injection of a few drops of frog's blood or some serum of dog's blood, both animals being naturally refractory to the disease. The mice did not become affected when the injection had been made from seventy-two hours before, to five hours after, inoculation with anthrax virus. The authors did not know then to what substances in the blood to attribute this preservative action. Mr. Ogata has since succeeded in extracting from the blood of dog and fowl a substance which seems capable of conferring immunity upon susceptible animals ; it is a substance soluble in glycerine and insoluble in alcohol and ether. Its action is not interrupted by alkiline substances, but is by small doses of carbolic acid or chlorhydric acid. It is inactive in the presence of digestive fluids or at a temperature of 45° C.; mixed with glycerine it keeps its activity a long time. It does not peptonize fibrin nor saccharify starch. According to Mr. Ogata, it is a ferment to which a few disinfectant properties are attributed, for it destroys the bacilli of cholera and of typhus. This discovery will be watched with interest. (Elsewhere under the head of "Technique," will be found the method of preparation of this substance.)

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BACTERIOMANIA.

WE still hear doctors — some years behind in study and thought, though having prestige in the world — accuse those who base their practice largely on the teachings of the bacteriologists, of "bacteriomania." Even in France, the country that gave birth to bacteriology, an occasional protest is sent forth by a few retardative writers and medical practitioners. It is curious that those men can offer nothing else in their fight against micro-biology than mere protests, sarcasm, and weak attempts at ridicule. They do not seem to realize that such flimsy attacks clearly show the dense ignorance of those who indulge in them. In order to prove the fallacy of a doctrine which appears at once as plausible as bacteriology, one must bring forth facts of a more weighty character than childish or scurrilous reflections.

Common sense alone suggests to the mind the truths of bacteriology, even when one only reads about the life, habits, and possibilities of microbes. But when one studies them closely, cultivates them, inoculates them, produces disease with them, etc., etc., the fact that their relation to man, the lower animals, or to any other medium (dead or alive) in which they may grow, is that of seed to soil, is very apparent. Indeed, it is made evident. Why physicians will persist in interfering with the progress of a doctrine so plainly beneficial to mankind, is beyond comprehension. It is true there are "bacteriomaniacs" who see dangerous germs in every disease. These are extremists such as exist in every department of life. They are enthusiasts who are carried away by others' investigations, and various effects or scope of the discoveries made from time to time. If the medical profession will only think seriously, consider, and sift the thoughts, arguments, and especially the practical demonstrations of reliable and cautious scientists, they cannot fail to see the rationale of bacteriology from a medical point of view. Judging from the prints of a few in this and foreign countries, who seek to lower the prestige of the doctrine of bacteriology in medical and other journals, we are tempted to suggest that they study the question from a scientific and practical standpoint, before criticizing those who have convictions reached by conscientious work. P. P.

ALCOHOL AS A FOOD.

ONE of the most absurd arguments in favor of the use of alcohol, is that it is a true food. We say this argument is absurd, for the reason that, if true, it is not in any sense a defense of the common use of this drug, since no man, unless absolutely deprived of all other means of sustenance, ever resorted to the use of alcohol as a substitute for other food, except the periodical drunkard, who on his occasional sprees sometimes abandons, for days in succession, ordinary food, in favor of alcohol.

Alcohol, even if a food, offers no advantages over other foods. If compared with such foods as wheat, corn, oats, etc., it is at a great disadvantage. Alcohol, if a food, is also confessedly a poison, which is not true of any of the foods mentioned, — nor, indeed, of any wholesome food. Again, if admitted to be a food, alcohol is quite too expensive to constitute a sub-

stitute for other foods; a bushel of wheat, for example, which costs less than half as much as a gallon of alcohol, would prove, on analysis, to contain at least three or four times the nutritive value of alcohol, even admitting the drug to be a pure nutrient.

But facts show that alcohol is really not a food. When taken into the body, it undergoes some chemical changes, but this is also true of almost every substance which could be named. Even such mineral substances as iron, lead, and arsenic are changed or oxidized in the body, as is alcohol, yet these substances are not, in consequence, claimed to be foods. Alcohol lessens oxidation, which has led to the claim that it lessens the tissue-wastes, and so, while not exactly a food in a positive sense, is, in a negative or indirect way, a sort of food. But this is also true of strychnia and a variety of other poisonous substances. Does this fact constitute strychnia a food? — Certainly not. Hence the argument cannot be allowed as holding good in relation to alcohol. Dr. Lauder Brunton, who undertakes to defend the theory which makes alcohol a food, after asserting that under some circumstances it might be "a very useful food," immediately adds, "As it interferes with oxidation, it is an inconvenient kind of food." Most certainly it must be very *inconvenient*, since it not only is not itself a food, but actually interferes with those processes by which proper food-substances are utilized and made of service to the body. As a specimen of the kind of arguments by which Dr. Brunton attempts to prop up the popular fallacy respecting the food value of alcohol, we present the following, which possesses all the greater significance because of Dr. Brunton's usual clearness and consistency in his teachings upon questions relating to science or therapeutics. Speaking concerning the influence of alcohol upon temperature, he says: —

"The action of alcohol upon the temperature seems to depend upon two factors. One of these is its power of lessening oxidation, but this only comes into consideration with large doses, when this factor may aid considerably in reducing the temperature. The other factor is the dilatation of the vessels on the surface, which occurs even after moderate doses. This dilatation allows the warm blood from the interior of the body to circulate more readily near the surface, and thus subjects it to the cooling influence of the surrounding air, and also to the cooling effect of evaporation from the skin. By increasing the sweat, it may lessen the temperature of the body, even when that of the surrounding air is as high or higher than it, and it will also cool the blood by freer radiation when the temperature of the atmosphere is below that of the body. It is evident that the cooling effects of alcohol will thus depend to a great extent on the atmospheric conditions of temperature and moisture to which the person taking it is subjected, as well as on the quantity of alcohol. Normally, when a person is subjected to cold, the vessels of the skin contract and prevent the warm blood in the interior of the body from approaching the surface and thus becoming cooled; but when large quantities of alcohol are taken, this mechanism becomes paralyzed, the blood from the interior circulates over the surface, and is cooled down more and more until its temperature becomes so much reduced as to be incompatible with life, and the patient is frozen to death. The dangerous effects of alcohol under such circumstances are well known to the lumberers in Canada and to Arctic voyagers, who dread alcohol and generally avoid it altogether."

The above is a very excellent argument against the theory that alcohol is a useful food. Proper foods are of service to the body as a means of maintaining the necessary degree of animal heat; but, as

Dr. Brunton clearly shows, alcohol causes a waste of heat, and to such a degree as to render its use absolutely dangerous under conditions where the bodily heat must be economized. Is it not then surprising that the doctor should immediately proceed with the following recommendation of the use of alcohol?

"The utility of this self-same action of alcohol is very evident when a person comes from a cold atmosphere into a warm room; for here the individual may still remain cold, although in front of a fire, as the contraction of the surface vessels now continues and the blood is no longer able to convey warmth to the interior, just as it was formerly unable to convey the cold. If alcohol be now taken, and the vessels dilated, the blood is allowed to circulate in the surface, soon becomes warm, and thus diffuses the warmth equally through the body."

The absurdity of this reasoning must be at once apparent. In order for the blood to be warmed during its sojourn in the skin, the temperature of the surrounding air must at least be greater than that of the body, otherwise heat would be given off from the body to the air, instead of the reverse. How often does a person who comes in from out of doors on a cold day chilled, find himself in an atmosphere above 100° F. Since the temperature of the interior of the body is constantly maintained at about 100° F., it is evident that so long as the temperature of the surrounding air is lower than that, the blood will continue to be cooled at the surface of the body, instead of being warmed. But Dr. Brunton has also shown (see paragraph first quoted) that the use of alcohol lessens the temperature of the body, "even when that of the surrounding air is *as high*, or *higher* than it." It thus appears that the use of alcohol would be detrimental, even under the circumstances recommended by Dr. Brunton, unless the person should place himself in air of a very elevated temperature.

It is vain for physiologists to longer attempt to prop up the ancient error, that alcohol possesses value as a food substance. Its properties are anti-physiological, and however useful it may be as a medicine under some pathological conditions, science does not afford the slightest excuse for its use as a beverage, or as a substitute for any substance which the physiological needs of the body demand.

J. H. K.

BACTERIOLOGY IN MEDICAL COLLEGES.

THE foremost medical schools of the country — those of four years' terms, particularly — devote considerable time to bacteriology; but the scores of short term schools still teach but very little on the subject, and that often very imperfectly, sometimes in a few hurried lectures more or less notable for their shallowness and inacuracies. Moreover, there are schools in America so behind the age as to teach that bacteriology is nonsense. It is evident, however, that the spirit of the medical profession, is fast approaching the idea that bacteriology must have more attention in our schools. It has become apparent that the doctor who is ignorant on the subject, is greatly handicapped from a practical standpoint.

The fact is, the practical departments of medicine are often taught in our schools (many of them existing as financial investments or advertising media), to young men having no education to understand. They graduate with a head full of precepts, their memory loaded with lectures and visions of cases seen, but they have digested nothing. They are loaded to the muzzle to pass examination, and after that they must experiment at the expense of the people, often jeopardizing lives, and sometimes with fatal results.

It is evident that more general preparation should constitute the foundation of medical education. At the very begin-

ning of medical studies the principles underlying them should be mastered. Histology and the relation of tissues to micro-organisms should be demonstrated early, in a practical manner. Laboratory practice should enter in a large measure into a student's curriculum. And, as much as possible, the lectures should be illustrated, practical, and not mere oratorical flights, which are often beautiful, but empty words. (Oratory in the class-room, if sustained by practical knowledge and common sense, is convincing, but many of the best teachers are poor talkers.) It is to be hoped, for the benefit of the profession and the people, that bacteriology will constitute a larger share of the medical courses of all colleges. It is not an incidental subject, but an absolutely necessary one. It is essential to a physician's equipment. P. P.

SCHOOL REFORM.

That many reforms are needed in the popular educational methods of to-day, has long been apparent to all intelligent thinkers who have given any special attention to the matter of education, or rather, mind and character building, which should be the purpose sought in the training to which human beings are subjected during the developing period. We are glad to note that some very profitable discussions of these vital questions occurred at a recent educational meeting held in Brooklyn, N. Y., Feb. 16, 1892.

The meeting was chiefly composed of State superintendents of education, presidents of colleges, and men of equal note, and the discussions and deliberations which occurred were more than ordinary in character.

President Eliot, of Harvard, who has recently been making a very careful study of grammar-school and high-school work, offered many pungent criticisms upon the methods at present in use, and declared that the majority of the work done in the grammar-schools of the present day is mere "marking time." He made many practical suggestions looking toward reform which, we are glad to note, were well received by the convention. Among these, was the early introduction of algebra, a natural science, as a mathematical study. Elementary algebra is certainly less difficult than some parts of arithmetic which are commonly studied in grammar schools, and an early acquaintance with algebraic methods would unquestionably assist greatly in the understanding of many arithmetical principles which are never clearly understood until long after the study of arithmetic has been finished and the study of algebra begun. The early introduction of the natural sciences in the school course, is a matter which has long been advocated by many experienced teachers. Many years ago, the Harpers did a useful work in this direction by the introduction of a series of readers devoted almost exclusively to the natural sciences. Unfortunately, however, the popularity of these works was not long continued, probably because their value was not appreciated. The young child is far better prepared to study the natural sciences than abstract subjects, and the influence of these studies upon the mind of the child in quickening his perceptions and enlarging his mental horizon, is of a most salutary character. It is to be hoped that the value of Prof. Eliot's suggestions will be recognized by leading educators throughout the country, and put in practice at the earliest practicable date. J. H. K.

Intestinal Gymnastics. — In many cases of chronic constipation, the cause of the disorder is simply the lack of muscular activity in the lower bowels. Many methods have been employed for increasing the muscular activity of the intestines, — such as massage, muscle-breathing, the galvanic and faradic currents, and a variety of gymnastic exercises. Walking,

horse-back riding, and especially Swedish gymnastics, are certainly very useful means of stimulating the intestinal peristaltis. The purpose of this note is to call attention to a fact well enough known to practical physiologists, but perhaps not so widely known among practicing physicians as it should be. Physiological experiments have shown that rapid voluntary movements of the external sphincter ani and the levator ani produce very active peristaltic movements of the large intestine. This effect is produced by the mechanical excitement of the plexus myentericus of Auerbach. This curious automatic center lies between the two muscular coats of the intestine, and controls the peristaltic movements. A patient suffering from constipation should make powerful movements of the sphincter ani, and of the levator ani, in as rapid succession as possible, continuing the exercise for three or four minutes, or until the muscles are fatigued. The time chosen for the exercise should be either before breakfast, or an hour after breakfast, according to the natural habit of the individual in respect to the evacuation of the large intestine. J. H. K.

Astonishing Medical Advice. — A hospital has recommended that women whose nerves are irritated by small worries should calm them by resorting to smoking "if their doctors recommend it." This suggestion has caused a protest prompted by horror or disgust that the fair sex should be recommended by medical authority to assume the pipe, the cigar, and the cigarette, which, for the most part in this country, have been monopolized by men, smoking by women being chiefly confined, as one writer well says, "to the fast and the loose." Some voices have been raised in defense of the surgeon, however, Mr. James Payne maintaining that there is no more reason why men should have all the benefit of tobacco, than, as John Wesley observed, "that the devil should have all the best tunes." We rather agree with Mr. Payne. If tobacco is good for men, no reason can be offered why it should not be good for women also. Belladonna, stramonium, strychnia, opium, and even alcohol as well as all other drugs with the exception of tobacco, are prescribed for human beings without distinction of sex; why then does the doctor draw the line at tobacco? Is there any particular virtue or lack of virtue in man which renders him susceptible to the therapeutic influence of tobacco which women do not share? If any such sexual peculiarity exists, it has certainly never as yet been pointed out in any scientific work on therapeutics. If the women have been unfairly treated by not being allowed to smoke when they feel nervous, when their husbands are given full liberty to do so, certainly the injustice ought not longer to exist. If tobacco-using is good for men, it is good for women also. Possibly the assumption of the pipe and the cigar by women, would be the best means of exhibiting to men the enormous filthiness, harmfulness, and costliness of the use of the weed. We are inclined to think that the item of expense would appeal powerfully to the average smoker. How many men who smoke half a dozen twenty-cent cigars per diem would be willing to supply their wives and daughters with an equal number of fragrant Havanas every day of the week? There is a recognizable relation between smoking and selfishness.

We have no fears that the advice of the hospital will be followed. The women of America are coming to recognize, pretty unanimously, the fact that tobacco is an enemy of the virtue of American women, and of the home, and their voices are being raised in an outcry against this invader of the purity and sanctity of the household; and before many years, doubtless, her hand as well as her voice will rise in protest at the ballot-box, in the

shape of prohibitive laws against this intolerable nuisance, the tobacco habit, the foreshadowing of which may already be recognized in the passage of laws prohibiting the sale of tobacco to young boys, and its use by pupils attending the public schools. J. H. K.

A Fact Useful for a Laparotomist. — It is sometimes important for a surgeon who has made an abdominal section for any purpose, to know with absolute certainty in which direction the stomach lies from a given point of the intestine. This, of course, can be ascertained by overhauling the intestine, till the stomach or the ileo-secal valve is reached; but this involves an amount of handling the intestine which, to say the least, is not conducive to recovery. Nothnagel has pointed out the curious fact, that when a crystal of carbonate of soda is applied to the peritoneal surface of the intestine, it will invariably excite its contraction, which passes upward toward the stomach, — never toward the rectum.

An Interesting and Instructive Experiment. — In a recent lecture delivered before the Pathological Society of London (*British Medical Journal*, March 19th), Dr. Ruffer related the following very interesting experiment : —

"If an adult guinea pig be inoculated subcutaneusly with 6.25 cubic centimeters of a pure culture of the bacillus pyocyaneus, an abcess slowly forms at the point of inoculation. Twenty-four hours after the injection, the point of inoculation is crowded with bacilli and well-filled phagocytes; but — and this is the important point — cultures made from the various internal organs prove absolutely sterile. The bacilli, therefore, are arrested at the point of inoculation by the amœboid cells, and this can be proved by microscopic examination.

"Now if, at the same time that we inoculate the bacillus pyocyaneus on one side of the body, we inject on the other side a large dose of chloral hydrate, which is yet not sufficient to cause death, and repeat the dose from time to time, so as to keep the animal fully anæstheticized, it invariably dies within forty-eight hours, and all the organs contain the bacilli in incredible numbers.

"It is easy to prove that in an anæstheticized animal the leucocytes are inactive. Let us take two small sponges, fill them with a pure culture of the bacillus pyocyaneus, and place each under a guinea pig's skin. One of these animals we leave as a control, whereas we inject the usual quantity of chloral hydrate under the skin of the other. Six hours afterward, when we take out both sponges, we find the fluid in the sponge of the chloralized animal almost as clear as when it was introduced. A few leucocytes may be seen in it, — ten or twenty at most in one cover-glasspre paration, — while the control sponge is filled with a thick purulent material, which, on microscopic examination, proves to consist of innumerable well-laden phagocytes. No wonder, then, that when the leucocytes refuse their work the bacilli should find their way into the tissues. We have vainly sought for any evidence to show that the fluids of chloralized guinea pigs are better cultivating media for the bacillus pyocyaneus than those of a non-chloralized animal; in both chloralized and non-chloralized animals the bacilli seemed to thrive exceedingly well in the fluids of the living body. Here we have another instance of the action by phagocytes in the limitation of disease."

From the above experiment, it is evident that the phagocytes which are the chief defense of the body against the invasion of germs, are rendered incapable of capturing microbes by chloral, and, it may be justly inferred, by other narcotic or anæsthetic substances. This statement seems to agree entirely with the interest-

ing experiments made by Lauder Brunton, ten years ago, in connection with Mr. Cash, by which it was shown that the oxidizing power of protoplasm is destroyed by morphia, codia, atropia, nicotine, and many other substances. The effect of narcotics is evidently to paralyze the protoplasmic elements of the body. These experiments are extremely interesting from a practical and hygienic standpoint. Do they not clearly teach that the habitual introduction of such substances as alcohol, tobacco, and possibly even tea and coffee, into the system may have the effect of lessening the ability of the body to defend itself against the attacks of pathological microbes, which are by all odds the most dangerous foes to human health and life? The conclusion seems irresistible, and sanitarians will doubtless seize upon this fact as a powerful reinforcement of their arguments against the alcohol and tobacco habits, as well as whatever else lessens the resistance and activity of the phagocytes.

REVIEWS.

The A B C of Swedish Educational Gymnastics.— By H. Nissen; F. A. Davis, Philadelphia. This little book of 102 plates is a *vade mecum* of Swedish educational gymnastics, and is admirably adapted to serve its purpose — that of a practical manual for the teacher of Swedish gymnastics. The author asks and answers concisely more than 150 questions, just such as the student or inexperienced teacher would be most likely to ask. The cuts are, as a rule, good, and are sufficiently numerous to illustrate the subject satisfactorily. The positions shown in a few, we think, might be improved, but this is probably the fault of the artist and not the author. Any one interested in Swedish gymnastics will certainly be pleased with this little work.

Treatment of Laryngeal Phthisis.— By Robert Levy, Professor of Physiology and Laryngology, Gross Medical College, Denver, Colo.

This concise paper sums up in a most admirable manner the therapeutics of laryngeal phthisis, presenting in a nutshell the essentials of what has been published in recent times respecting the various new and valuable remedies which have been offered to the profession for the last few years. As a concise epitome of knowledge upon this single subject, the paper is really a very excellent model. The author also gives results of his own work, which are certainly excellent, and appends a bibliography which will certainly be of interest to all who wish to keep themselves posted upon the subject considered.

Notes on General versus Local Treatment of Catarrhal Inflammations of the Upper Air Tract. — By Beverly Robinson, M. D., New York.

In this excellent paper, the author takes the ground that many specialists in diseases of the nose and throat have been somewhat too exclusive in their attention to the local malady, and have not taken sufficient pains to investigate the bearing of the general conditions upon local morbid manifestation. The arguments and facts presented are such as must convince any one of the correctness of the author's position, as indicated in the following words: —

"I believe, and I always have believed, that the true position is held, and only can be held by the general practitioner who has sufficient special training to allow him to be fully appreciative of what is being done properly in that line, but who is in daily contact, also, with the multiform diseases of the human economy in almost every organ."

The Economic Basis of Prohibition. — By Prof. Simon N. Patten. American Academy of Political and Social Science, Phila. publishers.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., APRIL, 1892.

ACTION OF ESSENTIAL OILS AND CREOSOTE ON CERTAIN BACTERIA.

THE director of this department (Lab. of Hygiene) investigated the influence of the essences of cinnamon, of turpentine, of creosote, etc., on the microbes of the mouth, and on the bacillus of tuberculosis, the object being to determine what effects they may have when used directly in the form of fine spray and lotion.

Experiment A.—Mixed plate culture of the microbes of the mouth (made with the rinsing of the mouth before using brush in the morning). A fine spray of essence cinnamon was directed twice daily (morning and night) into the glass bell containing the cultures, by means of "The Globe Nebulizer."[1] Each spraying was continued ten minutes. The arrangement was such that a filtered current of air entered with the spray and passed out again, carrying part of the material out, almost as in inhalation. The treatment began when the culture was two days old and well under way, there being over a hundred colonies within four inches square.

During the intervals of spraying, the culture was kept at a temperature varying between 75° F. and 80° F., very favorable for its development. After two sprayings, the growths seemed retarded. After three sprayings (twenty-four hours) they were visibly modified and interrupted. After four sprayings (thirty-six hours) many of the colonies seemed to have lost all vitality and contracted. Cultures from these failed to grow. Other colonies still alive. After five sprayings (forty-eight hours) few colonies presented living appearance on the surface, but several were still alive. Finally, spraying twice a day was continued until the tenth one (ninty-six hours after the first), and only after this did the germs grown on the surface of the plate fail to develop in culture tubes.

In the bottom of the deeper furrows made by the inoculating needle, however, live germs still existed, and spraying failed to destroy the growths extending laterally from the depth, under and within the gelatinous medium until the sixteenth spraying (156 hours after first dose), when the material seemed all permeated or affected by the cinnamon.

Experiment B.—Plate culture like the above and treated in like manner with essence of turpentine.

The effects were much less noticeable and much slower. It took six days of spraying (morning and evening) to alter any growth perceptibly, with the exception of the smallest colonies. After this the growths were impeded and arrested gradually. Two weeks after the first spraying, the surface germs seemed arrested in their development, but occasionally a culture was fruitful. In the bottom of the furrows the germs were still alive. All life seemed extinct after the eighteenth day. Left to itself, the culture died.

Experiment C.—Three plate cultures of tuberculosis were treated, one with essence of cinnamon, the second with turpentine, and the third with the following prescription of Dr. H. M. Dunlap, of this institution:—

Oil Scotch pine, 10 m.; creosote (pure beech), 20 m.; oil cinnamon, 10 m.; oil bay, 10 m.; oil eucalyptus, 30 m.; pip menthol, 10 grs.; tr. benzoin, 2 oz.

These cultures were known as 1, 2, 3, of experiment C.

In culture 1, the bacillus of tuberculosis fairly under way, was interrupted slightly in its growth after five days of two 10 minute sprayings a day with cinnamon. The sixth day the depression was very apparent. The eighth day the surface germs appeared dead, but the germs nearest to the medium were alive. The tenth day, the germs in the bottom of inoculating furrows gave evidence of life and produced cultures. Between the tenth and fifteenth day, life became to all appearance entirely extinct, there having been used in all, thirty sprayings of ten minutes each, or five hours of spraying all told, with intervals of twelve hours between each treatment, in which the germs had chance to recuperate. It is possible, however, that many

[1] Dr. Dunlap's, of the Battle Creek Sanitarium. Altered for the purpose.

bacilli in the lines of inoculation were still alive and I should, no doubt, have found it to be so had I been able to make secondary inoculations with all points of the interrupted growths.

After the twentieth day of spraying, the culture was left alone in the most favorable temperature, but growth never again appeared.

Culture 2. Treatment same as the preceding, but with essence of turpentine instead of cinnamon. An accident occurred to this after the sixth day of treatment, by which some air germs and fungi invaded the growth, and the identity of the bacillus tuberculosis became uncertain, and experiments unsatisfactory, so far as the action of turpentine on tuberculosis was concerned.

Up to the sixth day, however, the bacilli seemed very little affected by the turpentine, the complete destruction of all growths (including the invading organisms) did not occur until after twenty-three days of spraying (ten minutes evening and morning as in the previous cases).

Culture 3. Pure culture of bacillus of tuberculosis. Thicker layer of medium than in Nos. 1 and 2. Growth very much more abundant and older by four days. Spraying twice a day, ten minutes morning and evening with the creosote prescription above given.

After four days, the growth seemed affected and slightly interrupted. After six days the edges of the four large colonies began to contract. The surface began to change slightly in color. The eighth day the growth was very plainly interfered with. The tenth day the colonies began to decline and wither, as it were. Cultures from the edges and the surface failed to grow. Cultures from the layer of germs nearest to medium in the streaks of inoculation developed. The twelfth day things seemed stationary. Here again, an accident occurred, and contamination took place by which it became impossible to follow the action of this preparation on the bacillus of tuberculosis. I had selected this prescription because it is used by inhalation in cases of pulmonary tuberculosis.

It is reasonable to suppose, from the above experiments (the first of several series to be carried on this year to test the microbicidal action of different drugs), that essence of cinnamon is a powerful antiseptic as has been published long since, and may be perhaps used to advantage for bacterial diseases of the nose, mouth, throat, lungs, etc., where sprays are often directed. Turpentine seems much less powerful. The prescription used in culture 3, of tuberculosis, was used chiefly to try the combined effects of cinnamon and creosote. The effects were encouraging up to the time of the accidental contamination with foreign germs.

This is only a preliminary report of progress and only gives indications of the possibilities of the bactericides used. Doubtless the results in a number of tests would vary somewhat. The luxuriance, richness of medium in nutritive material, thickness of the soil, and protection from the chemicals had a great deal to do with the results. Later, some tests will be made with these ingredients diluted with excipients in the manner of prescriptions used in practice.

ONE CAUSE OF ANTAGONISM TO THE GERM THEORY IN TUBERCULOSIS.

THERE are still some physicians, even among the teachers in medical schools, who not only refuse to admit, but antagonize the teachings of those who hold that the bacillus of tuberculosis is the active cause of this disease. Among the most prominent men who hold that the bacillus is only an incidental organism in pulmonary phthisis, many base their views on the fact that they have failed to find it in certain decidedly clear cases, and even in affected tissue after death, and yet the lesions were positively, in their estimation, those of so-called "true consumption."

There are doubtless many explanations for these differences of opinion on the subject of tuberculosis. But in the writer's estimation, there are two things which have misled physicians in the majority of cases. One is their absolute, indiscriminate reliance on all methods, chemicals, and formulas, under all circumstances; and the other is the failure to realize that many germs enter the lungs, which may, under certain conditions, produce rapid disorganization or slow transformations, and act either as secondary agents to complicate tuberculosis (perhaps even destroying the bacilli of this malady), or act as primary microbic factors in a weak spot.

During the last three years, I have had many opportunities to test all the stains recommended in the best works for the bacillus of tuberculosis, and to make many comparative trials. I have taken the sputum of certain patients and stained it carefully with a half dozen or more stains, all of which were recommended very highly, and sometimes one would show the bacilli, and another would not.

In order to arrive at the cause of these failures, I prepared the following stains carefully, with as pure samples of dyes as I could procure, and then made comparative tests with sputum in which I had, as a rule, already found bacilli.

The stains and methods were: Neelsen's, Erlich's, Koch's original, Gibbes' new method, Pittion & Roux's, Paquin's, Burrill's. With these seven methods, I found the following:—

Sputum A.— Two drops thoroughly mixed and broken up in a cover-glass with a blunt glass rod. Fourteen cover-glasses were smeared; two each stained according to each of the above methods. Result: The bacilli were demonstrated well and clearly by Neelsen's, Pittion & Roux's, and Paquin's; fairly by Koch's original; poorly by Burrill's; and not at all by Gibbes'.

Sputum B. — Known to contain bacilli in large quantity. Two drops were thoroughly mixed, and fourteen cover-glasses were smeared, two of each being stained carefully by the above named methods. Result: Bacilli clear and plain by Pittion & Roux's and Paquin's methods; fairly well by Neelsen's, Burrill's, and Koch's; not demonstrated by Gibbes'.

Then I purchased Burrill's stain and Gibbes' stain already prepared, in the market, and again made tests as follows:—

Sputum C.—Full of bacilli of tuberculosis. Tested Pittion & Roux's, Gibbes', Burrill's, and Paquin's stains. One drop of sputum was thoroughly mixed; eight cover-glasses were smeared; two were stained with each stain. Result: Bacilli plain with Pittion & Roux's, Paquin's, and Burrill's stains; barely but sufficiently perceptible with Gibbes'. Three more mounts were then stained with the latter stain, and one was reliable for diagnostic purposes; the other two demonstrated no bacilli.

Sputum D.—Bacilli very scarce, but clearly demonstrated previously. One drop of sputum was thoroughly mixed as in other cases, and twelve cover-glasses were smeared, and three of each were stained with each of the four stains mentioned. Result: Two of the slides showed bacilli plainly with the Paquin stain; one plainly with the Pittion & Roux method; one poorly with Burrill's; and none were demonstrated by the Gibbes method.

With the same stains older,— four weeks later,—poorer results still were obtained with Koch's, Burrill's, and Gibbes' stains. The others were not affected.

A few days ago (middle of April), a friend made comparative tests of the Gibbes stain and the Pittion-Roux-Paquin stains with a drop of sputum full of bacilli, and found them clearly and profusely with the latter, while he absolutely failed with the former.

It seems to me that physicians have been relying too much on dyes and stains put on the market, and have often failed, for this reason, to find bacilli of tuberculosis where they really existed. This has misled them.

It is not implied here that any of these methods are always, or at any time, in themselves unreliable, for, by previous trials and further tests, I have had excellent results with Koch's, Burrill's, and Gibbes', the three processes which gave the least satisfaction in the above recorded cases. The trouble comes, very frequently from the use of inactive (though said to be C. P.) material in preparing the staining fluids. The most reputable firms often innocently furnish dyes which are worthless in microscopy. The authors of the staining processes and their followers are innocent victims of innocent chemists.

There is no question of the occasional worthlessness of the dyes used in compounding staining fluids.

Another cause of error, just discovered, is that the application of heat to a slide, until the Canada balsam boils, sometimes fades the stain fixed on the bacilli and they instantly become invisible. This occurs chiefly with certain fuchsin stains, when it is fixed faintly on the germs, and discoloration has not been perfect in the background. I am not just now prepared to say more on this point.

IMPORTANCE OF GOOD STAINS IN ALL MICROSCOPICAL WORK.

THE necessity of procuring any particular brand of material to prepare stains, or of obtaining any particular stain already prepared by specialists or competent firms, is underestimated. As will be seen by the tests recorded in the preceding article concerning tuberculosis, it is an absolute necessity to have reliable stains, to give any value whatever to any attempt at the microscopical diagnosis of tuberculosis. Even with the famous formula of Koch, and the process of Gibbes, both of which have been in vogue for many years, one may fail to find the bacillus of tuberculosis in sputum in which it actually exists. Nor is this failure always due to carelessness in mounting or staining, as might be supposed, for one may, with one sample of either stain, find these microbes in a given specimen of sputum, and with another sample, prepared with chemicals from another source, utterly fail with the very same specimen.

And what is true in regard to stains for the diagnosis of the bacillus of tuberculosis is true in regard to all stains used in microscopy. It is necessary always to have the purest and most effective stains obtainable. Failure in staining properly, when one is working from an artistic or a student's standpoint, is disappointing enough, and misleading, very often

to a baneful degree, as one is sure to find out sooner or later; but failure to obtain proper results in staining anything from a diagnostic standpoint, particularly where life is at stake, and the treatment to be used depends on the microscopical analysis, is a dangerous thing, which may lead to the most serious mistakes and painful consequences. If the microscope is to be depended upon, the preparations to be studied with it must be properly made and reliable in every detail in a technical sense.

Indeed the microscope is worse than useless—it is often misleading and dangerous—when the object to be studied to help in diagnosis is stained with ineffective or unreliable drugs.

The great misfortune about this matter is that one cannot, so far as I know, determine in advance, by any other process than repeated microscopical tests and comparative studies, when a dye is and is not good. This is true at least of all the coal tar colors. Some of these may be, so far as analysis can indicate, perfectly pure, and yet there is something about them that renders them more or less unreliable in the preparation of staining fluids. When thus compounded, they fail to give the results expected. I have in my laboratory a number of coal tar colors, obtained from the very best houses of the country, and which I have no doubt are pure, and yet many of them are useless for staining purposes in microscopy. On the other hand, I have had magnificent results with many such products from the very same houses. The only two brands of aniline dyes which have uniformly given me satisfaction are those of Chemist Grübler and Chemist Münder, of Germany. Their reagents, too, are excellent, and always reliable.

TECHNIQUE.

To Extract Bactericide Substances from the Blood and Confer Immunity against Charbon.—Prof. M. Ogata, of Tokio, Japan, gives the following method of extracting a ferment from the blood to prevent anthrax. He claims that it has disinfecting properties and power of preventing the growth of micro-organisms. Take one part of blood or serum from a dog or chicken, and add from 10 to 15 parts of a mixture composed of equal parts of absolute alcohol and ether. After one or two days, filter, gather the residue on a filter paper and dry in the air. Pulverize this in a mortar, add a little tepid water, or a mixture of glycerine and water (equal parts) to the quantity of half the volume of the blood employed. After three quarters of a minute, filter rapidly through a cloth, then through filter paper. Add to the liquid filtered, 10 times its volume of alcohol and ether. Let it rest, and filter it at the end of one day. The residue is dissolved in water (one fourth the original volume of the blood), then add an equal quantity of glycerine. The dose necessary to produce immunity may have to be determined each time because of the variable quantity of ferment contained in the blood. In his experience, M. Ogata has produced immunity in mice with half a drop of glycerine extract, and in guinea-pigs with 2½ drops.

To Clean Slides and Cover-Glasses.—Dr. Friedrich Knauer (*Centralblatt fur Bakteriologie*, X, p. 8) gives the following improved method of cleaning prepared slides: They are thrown into a porcelain or glazed dish containing a half liter of a ten per cent solution of lysol. A batch of sixty or eighty is placed in a steam sterilizing apparatus or over a fire for half an hour. Before they are allowed to cool, a jet of cold water is directed upon them, rinsing them until the water is perfectly clear. Nothing now remains to be done but wipe them with a clean, soft cloth, free from grease. The advantage of this method is that it affords a thorough disinfection, and does away with the use of corrosive substances, such as sulphuric acid, etc.

Przewaski's Method of Imbedding in Paraffin.—The *Microscope* for February contains the following quotation from a German publication:—

"Dehydration in absolute alcohol may be avoided by the use of the following method, which is cheaper, surer, and applicable to larger masses: The piece is transferred from ordinary alcohol to anhydrous aniline oil, or oil containing but little water, and is to remain there for 24 hours. It is then transferred to chloroform, which penetrates it and dissolves out the aniline oil. After a sojourn here of 24 hours, it is placed in a solution of paraffin in chloroform (40 per cent), then in melted paraffin, which should be hardened immediately so that the tissue shall not become brittle.

"Aniline oil may be dehydrated by distillation or by placing in it a small piece of caustic potassa. The oil gives the specimen a yellowish amber, translucent appearance, which disappears as the chloroform enters. This method has the additional advantage of allowing the use of specimens not entirely dehydrated, the chloroform taking the water when it is mixed with aniline oil. Finish in the usual way."

BULLETIN OF THE

MEDICAL AND SURGICAL SANITARIUM,

BATTLE CREEK, MICHIGAN.

THE purpose of this department is to constitute, together with the Bulletin of the Laboratory of Hygiene, a record of the scientific work in the Medical and Surgical Sanitarium located at Battle Creek, Michigan, an institution incorporated as an organized and self-supporting charitable enterprise, all the earnings of the institution being devoted to charitable medical work, and the advancement of scientific medicine.

A NEW METHOD OF PALPATION OF THE KIDNEY.

HAVING been engaged for several years back in a careful comparative study of the relation of the positions of the several abdominal viscera and the pelvic organs in cases of disease of the latter structures, my attention has been especially called to the various methods heretofore in use for palpation of the kidney, the liver, and the other organs of the abdomen. The principal methods heretofore used have been as follows:—

1. Examination with the patient lying upon the back, the shoulders raised, the knees well drawn up so as to relax the abdominal muscles, the kidney being grasped between the two hands, the one behind and the other in front.

2. With the patient lying in the Sims' position (left for right kidney; right for left kidney).

3. The introduction of the hand and arm into the colon. This method has, I believe, been seldom resorted to. Certainly it is not a method to be commended for frequent use.

The first two methods mentioned are commonly sufficient to demonstrate the position and degree of mobility of the kidney, but in occasional instances I have found difficulty in forming a certain opinion upon these points, and something more than a year ago I hit upon the following plan which usually enables me to settle definitely any question relating to the position or mobility of either kidney:—

The examination is made with a person standing upon the feet, the buttocks resting against the end of a table, or, if more convenient, against the wall. The shoulders are dropped forward, the arms hanging loosely by the side, the head and chest also thrown forward by relaxation of the muscles of the upper part of the trunk, and the patient bends slightly downward, the center of motion being the waist, not the hips. By this means the abdominal muscles are relaxed as completely as possible, while at the same time through the influence of gravity the abdominal viscera fall into the positions which they usually assume with the patient in a standing position, so that the kidney, if displaced downward, or movable to an unusual degree, may be easily grasped. The palpation is begun by crowding the ends of the fingers of one hand slowly up under the ribs in front, the other hand making pressure at an opposite point behind. As the front hand is slowly forced down-



ward, if the kidney is out of place, its position will be readily discovered by the increased resistance, and then by proper manipulation, it may be seized between the two hands and its form outlined. By this mode of examination the kidney may often be grasped between the two hands when it could not be felt at all in either of the other positions mentioned.

A modification of this method which possesses some further advantages, places the patient in a sitting position, as shown in the accompaning cuts. With the body in a ver-

tical position, whether the patient is sitting or standing, the kidney is found in the position which it occupies at all times except when the patient is lying in a horizontal plane; whereas, examinations made with the patient lying upon the back, fail to detect the kidney in consequence of its disposition to return to its normal position when the force of gravity ceases to act upon it. If the patient is lying in the dorsal position, the kidney, although relaxed in the vertical position and dropped considerably out of place, may settle back into its usual position, so that the abnormality would not be discovered.

With the patient lying in the Sims' position,



the slightly displaced or movable kidney may drop into such a position as to evade the grasp of the examiner. But examined in the manner described, which I have termed "The Relaxed Vertical Position," the kidney falls into the very position which it usually occupies when the patient is sitting, standing, or walking, the conditions under which a displaced kidney is most likely to give rise to pain.

The information elicited by this method of examination is exactly what is required for an exact diagnosis, since patients suffering from pain as the result of displaced or movable kidney, are often perfectly comfortable while lying upon the back, or when reclining in any position, although they cannot sit erect without great suffering.

The importance of making an exact diagnosis respecting the position of the kidneys and other abdominal viscera in every case is coming to be more and more appreciated by gynecologists. A large share of the nervous and other symptoms which accompany common pelvic disorders, and which are usually attributed to them, will be found in many instances to depend less upon the pelvic derangement than upon a disturbance of the normal static relations of the abdominal viscera. I have become satisfied, from a careful study of the data obtained in several hundred examinations made with special reference to this point, that instead of charging the pelvic disease with being the direct cause of the distressingly long category of symptoms and ailments of which many women complain, the pelvic disorders themselves, as well as the symptoms wrongly attributed to them, are the result of disturbance in the positions and functions of the bowels, stomach, kidneys, and other abdominal viscera. Hence the folly of treating the pelvic ailments alone. Every examination of cases supposed to be suffering from pelvic disease should include a careful examination of the whole abdomen with reference to the position, and so far as possible, the condition of each of the organs found in this part of the body.

The accompanying figures show the proper position of the patient for examination in the relaxed vertical position.

MICHIGAN CLIMATOLOGY.

MICHIGAN enjoys a climate unequaled by that of any of the Middle-Western States. It does not, of course, afford the dry, rarefied air of Colorado and the far West, nor the tropical warmth in winter of Florida and New Mexico. These climates are required only by special classes of invalids, and then, usually, only at certain seasons of the year; but Michigan affords a typical "temperate" climate, being situated near the center of the temperate zone, and protected in such a manner as to preserve a more equable temperature than that of other States adjoining. Its rolling country and immense tracts of timber protect it to a very great degree, from the parching heat of the prairie States, while its location near the Great Lakes, surrounded on all but its southern boundary by a broad expanse of water, affords a still greater protection from the severe cold of winter and the intense heat of summer to which adjacent States are exposed.

Prof. A. Winchell, formerly State Geologist

of this State, and of world-wide repute, in his climatological charts of Michigan, remarks as follows respecting the climate of this highly favored State:—

"The sinuosities of the several (isothermal) lines will demonstrate at a glance the peculiar character of the climate of Michigan, and the fact that, both in summer and winter, it is better adapted to the interests of agriculture and horticulture, and probably also to the comfort and health of its citizens, than the climate of any other Northwestern State. The marked peculiarity of the climate of Michigan, in these respects, is attributable to the influence of the Great Lakes, by which the State is nearly surrounded. It has long been known that considerable bodies of water exert a local influence in modifying climates, and especially in averting frosts, but it has never been suspected that Lake Michigan, for instance, impresses upon the climatic character of a wood region an influence truly comparable with that exerted by the great oceans."

We also quote the following paragraphs from the pen of C. W. Garfield, the able Secretary of the Michigan Horticultural Society, who has also given the climate of the State of Michigan considerable attention:—

"The acknowledged superiority of Michigan as a fruit-growing State is believed to be very largely due to the favorable character of its climate. It is a well-known fact that large bodies of water, especially if at the same time they are very deep, yield but slowly to the varying temperatures of the seasons, holding in store in their depths a portion of the excessive warmth of summer until wrung from them by the angry, biting blasts of winter.

"In Southern Michigan the prevailing winds are southwesterly, reaching its shores after having been subjected to the equalizing influences already mentioned, in passing over nearly one hundred miles of the open waters of Lake Michigan, thus affording a partial exemption from the extremes of temperature which often operate so disastrously upon . . . the more Western States.

"From the data given, we deduce the conclusion that Michigan possesses a climate compounded of the average temperature of the summer of the Red River country of the North (latitude 48 degrees), and that of the winter of Southern Illinois and Indiana (latitude 40 degrees). It mantle of forest also may doubtless be largely attributed to the increments of moisture imparted to the winds in traversing the circumjacent waters, while the exemption of the State from the occurrence of tornadoes and cyclones is doubtless due to the equalizing influence of these surroundings."

When newspapers are rife with reports of scores of deaths daily from sun-stroke in the larger cities and even country districts of adjoining States, such a thing is almost unheard of in Michigan. But what about "Michigan malaria"? Unfortunately for the reputation of Michigan as a healthful State, the idea got abroad many years ago that the principal feature of its climate was malaria. "Going to Michigan" was considered almost synonymous with "going to have a fit of the ague." It was not supposed to be possible for a person to visit Michigan, or even to pass through the State, without having the "chills." There was, indeed, some foundation for such a reputation forty years ago, when the dense, primeval forests which covered her fertile soil were being cleared off, and the virgin earth for the first time was turned up by the settler's plow. The conditions were such as to afford the most favorable opportunity for the generation of malarial germs, which, for several years, contended hotly with the early settlers for the possession of the beautiful peninsula.

Civilization has conquered at last, however, and "Michigan malaria" is no longer anything more than a scarecrow which is now and then brought out by Western land agents, the advertisers of quack medicines, and the proprietors of "liver pads," as a sharp advertising dodge.

What was true of Michigan forty years ago, and for a few subsequent years, was equally true of Massachusetts, Connecticut, Rhode Island, and other New England States two centuries ago; but as the forests have been cleared away, affording free ventilation of the soil, the favorable conditions for the production of malaria have gradually disappeared in Michigan, as well as in the older States.

For sixteen years a meteorological station has been maintained at the Battle Creek Sanitarium for the State and Government Signal Service. On comparing the reports of this station with the reports of the stations located at Marquette, Traverse City, and Detroit, we find the temperature during the unusually hot weather of 1888—when nearly all sections of the country suffered from very extreme heat, persons being smitten down with sunstroke by the hundred in our large cities—to be as follows: Detroit, 101° in the shade; Marquette, 97°; Traverse City, 104°; Battle Creek, 96°. The thermometer only touched 96° on this single occasion during the entire summer, and then only for a few hours. Even at this temperature the weather was not so oppressive as

to interfere with any ordinary vocation, as elsewhere, as the heat was tempered by a constant breeze which gave the impression of a temperature much lower.

At the Sanitarium no one was uncomfortable. Patients enjoyed themselves as usual in the cool shade of our pleasant groves, or, if they preferred the quiet of the halls and corridors, they were refreshed with a cool breeze from the mammoth fans, entering the house at a temperature nearly ten degrees lower than the out-of-door air, and circulating freely through the halls. Thus, by the appliances of art, added to the special advantages afforded by nature, we are able to secure for our patients both summer and winter climatic advantages, natural and artificial, which are, to say the least, not to be despised.

The Peninsular State has for some years back been quietly growing into public favor as a summer health resort. The northern part of the State affords every year a grateful retreat for thousands of the half-smothered residents of the large cities and the sultry and malarious climates of some of our neighboring States. The rolling character of the surface in the middle and southern portions, gives rise to a great number of beautiful little spring-fed lakes, the wooded, sloping shores of which afford camping grounds for thousands who seek to find, during a summer vacation, rest in the lap of Nature from the wearing toils of business and professional life. The whole State is getting to be a great sanitarium.

Surrounded, except on the southern border, by immense inland seas, its climate is tempered by water-cooled breezes, so that the parched sultry air of other latitudes, during July and August, is scarcely felt here. There are probably few localities to be found which afford a better summer climate than Michigan. A leading physician who has resided in the State for more than thirty years, recently remarked, "A lady patient said to me the other day, 'Doctor, where would you advise me to spend the summer?' I replied, 'If you really wish to find one of the most comfortable and healthful summer climates in America, and are determined to avail yourself of its advantages, regardless of trouble and expense, I would advise you to go to — well, go to Michigan.'"

The editor of the *Rural Home*, Rochester, N. Y., while on a visit to Michigan some years ago, wrote to his journal, as follows:—

"I believe Michigan has more sunshine to the acre than New York has, and why it should be so puzzles me, too. The State is three-fourths surrounded by water, and within its area the water surface is large. Yet I never spend a week or two among the Michiganders but that I find them blessed with more clear sky than New Yorkers enjoy. We in Rochester claim that Lake Ontario troubles our atmosphere! Why should not Lakes Huron and Michigan breathe mist over the whole Peninsular State, on the same principle? There are some interesting questions in climatology that I propose to study up, if the time ever comes when I may go-a-fishing.

"I write this in Battle Creek, one of Michigan's smartest towns, where five or six years ago I spent two or three days pleasantly, and of which I then wrote at some length. It is a growing place, with decided manifestations of public spirit and private pluck. Its location is fine, and its surroundings attractive. There are manufacturing interests which compel growth and beget enterprise in the community; and these, I note, have enlarged their facilities vastly since my first visit. I haven't learned the city's present population — fifteen thousand will cover it. An Eastern air of refinement, and culture, and good morals pervades the town, mingled with much of that go-ahead thrift so characteristic of the remoter West."

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PUBLISHERS' DEPARTMENT.

We are glad to note that Dr. E. E. Montgomery, who has been for a number of years Professor of Gynecology in the Medico-Chirurgical College of Philadelphia, has recently been elected by the Board of Trustees of Jefferson Medical College, to the Chair of Clinical Gynecology, with a seat in the faculty. Dr. Montgomery's sound and thorough work in his department has well earned for him this distinguished honor.

Work of the Michigan State Board of Health.—We have received an interesting report of the Annual Meeting of the Michigan State Board of Health, held April 12, from which it appears that the Secretary of the Board has taken action for the suppression of 421 outbreaks of contagious disease within the last three months. From this, it must not be supposed that Michigan is a more unhealthy locality than other States, or more subject to contagious diseases. No one who has not had an opportunity to become thoroughly acquainted with the work of sanitary authorities can form any proper conception of the number of these outbreaks which are occurring every week, or, we might more properly say every day, within the limits of any territory so large as that of this State. The Michigan State Board of Health has made a remarkably good showing as the result of its efforts toward the suppression of contagious and infectious diseases. The statistics of the Secretary show that a great number of lives are saved to the State by this means every year.

One of the interesting features reported was the announcement by the Secretary that *cysticerci*, the embryonic or encysted form of tapeworm, had been found in bass from Saginaw, Mich. As human beings are subject to invasion by this worm, this is a very important discovery. It has long been known that the embryos of the broad tapeworm are sometimes found in fish, but this is the first announcement of the discovery of the parasite in the fish of this locality.

Fish inhabiting the sewer-contaminated waters in the vicinity of any large city, are very likely to be infected with these and other parasites. Prof. Cook suggests that "such fish should be well cooked." This is certainly a very pertinent suggestion, but as there might be some persons who entertain a distaste for cooked tapeworms. it is quite likely that some will prefer to choose food not likely to contain these parasites.

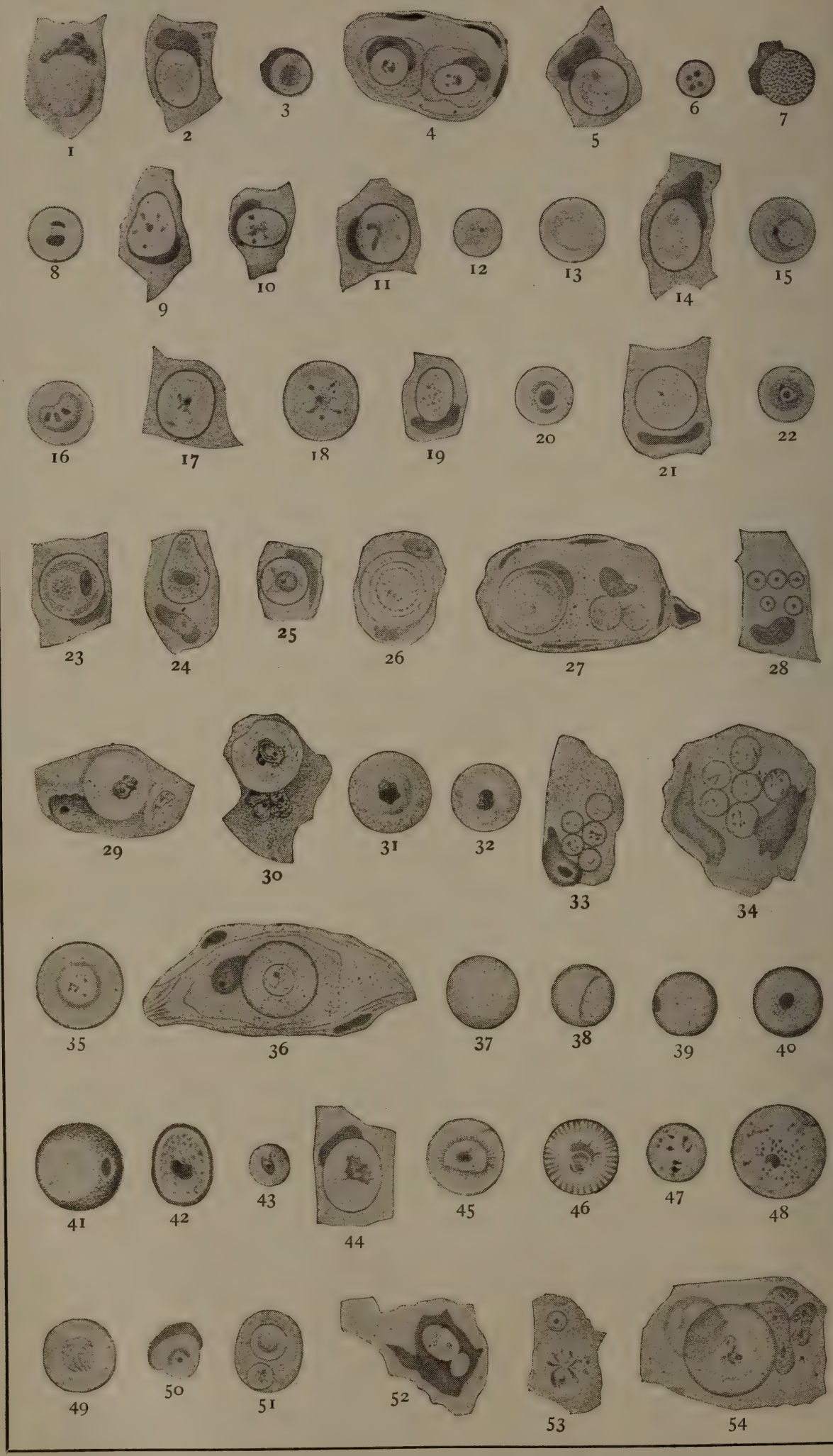
A committee was appointed to visit the city of Detroit, and study the difficulties which are encountered by Detroit health officers in the restriction of infectious and contagious diseases. We suspect that the particular difficulty is the non-belief of the health officers of that locality and the sanitary authorities of that city, in the effectiveness of sulphur fumigation as a means of destroying the germs of infectious diseases, since a report recently published by health officer Duffield seeks to show by statistics, the ineffectiveness of sulphur fumigation, from the fact that diphtheria sometimes reappears in a dwelling which has been fumigated with sulphur. Dr. Baker, Secretary of the Michigan State Board of Health, suggests that the reappearance of diphtheria in such cases is not due to the inefficiency of the sulphur fumigation, but instead, to the persistence of the disease in clinging to the bodies of patients who have suffered from it. Diphtheria germs have not infrequently been found in the mouths of patients who had suffered from the disease, some weeks after recovery. It is certainly very difficult to secure a complete disinfection of the person; perhaps this may be impossible in many instances. This fact emphasizes the importance of extending the quarantine of persons suffering from contagious diseases some weeks beyond the period at which the patient seems to be recovered from the disease.

The Mississippi Valley Medical Association will hold its eighteenth annual session at Cincinnati, Wednesday, Thursday, and Friday, Oct. 12, 13, and 14. An interesting program is promised. The President of this Association is Charles A. L. Reade, M. D., and the Secretary, E. S. McKee, M. D., both of Cincinnati.

The International Medical Review is the title of a new medical journal published at Washington, D. C., under the editorship of Dr. Charles Stowell, of that city, formerly Professor of Histology in the University of Michigan. With so able and talented a manager, the journal is destined to meet with success from the start.

A New Pepsin.—Parke, Davis & Co., of Detroit, Mich., the well-known manufacturers of fine pharmaceutical products, have produced what may fairly be called a new pepsin. In a recent test of pepsins made by an eminent European authority, we were glad to note that the American pepsins were ahead; the most active pepsins of the large number tested were of American manufacture. Parke, Davis & Co., to whom perhaps more than to any other firm, is due the great improvement of American pepsins, have recently surpassed all their recent achievements, and indeed those of all other manufacturers in this country as well as in Europe, by producing a pepsin which is capable of digesting 4000 times its weight of coagulated egg-albumen under the conditions of pharmacopœial tests. They claim in reference to this new product, that "it is prepared by a new and original process which renders it aseptic, free from odor, agreeable to the taste of the most sensitive palate, and superior to any pepsin hitherto made."

There are pepsins and pepsins in the market, a great share of which are worthless, some absolutely loathsome and far more capable of producing a fine crop of microbes and ptomaines in the stomach, than of aiding digestion. Parke, Davis & Co., seem to be ahead in pepsin as in many other pharmaceutical products, and the excellencies of the new pepsin which they offer, will doubtless be appreciated by the profession.



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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., MAY, 1892. NO. 7.

ORIGINAL ARTICLES.

PROTOPLASMIC FOCI-THEORY OF METABOLISM.

AN ELABORATION OF THE VIEWS CONTAINED IN THE PAPER READ BY DR. MORTON AT THE FIRST MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

BY HORATIO R. BIGELOW, M. D.

DR. MORTON'S views, as he has tersely stated them to me in a private communication bearing date, Oct. 8, 1891, are as follows: —

"In the voltaic couple the initial chemical exchanges are in the electrolyte and in the positive plate, not necessarily or initially in the negative plate to which the hydrogen goes. But the negative plate may very easily happen to be peroxidized (or oxidized), then here comes in anabolism, *i. e.* reconstruction of tissue and building up of new products (synthesis); I say, creation of fats, ferments, glycogen, and all that the animal builds or anabolizes. Now the main function of the living animal is not to build (anabolize) but to destroy (katabolize), affording waste products and energy; the animal releases the potential energy which the plant has stored up and which the animal takes in as food. But the animal does do some anabolic work, and I am claiming (perhaps very hazardously) that the anabolic work is due initially to katabolic work, and is an accidental or rather secondary process due to the presence of hydrogen and its congeners directed to the negative plate which happens to be oxidized. Thus you may find polarity — positive and negative — in normal and morbid processes, but there will be but one seat of chemical exchanges, and that one katabolic and electro-positive. That is why I have said in my paper that all foci of activity, normal and morbid, are electro-positive — all katabolic. You may draw a parallel, and say that the metabolic cycle of living is also the electric cycle of the voltaic couple. The tissues oxygenize and hydrogenize; one destroyed and reduced, or built up; the electrolyte, blood and lymph, is the intermediary. So of the voltaic couple (when its negative plate is to start with, oxygenized)."

These views, as a whole, are altogether new. I think, however, we shall find, as we enter into further discussion, that Dr. Morton does not give sufficient deference to the real constructive processes of cell life. It is conceded that energy is liberated whenever chemical union takes place, and whenever stable compounds are formed from less stable ones, in which the constituent atoms were less firmly held together. A man of Dr. Morton's mental astuteness would not hazard his well-earned reputation as a close thinker, by reiterating the aphorism that "Life is change," or that "life and nutrition" are synonymous terms. Neither at this late day would he waste any time in seeking to demonstrate what may be considered as proven. But I may add here, as being apposite, that I cannot conceive of metabolism, save as the sum of anabolism and katabolism. Before entering upon an extensive examination of this question, I may be allowed some lengthy quotations from Dr. Martin's work on the "Human Body," which very succinctly state what views are now entertained by physiologists: —

"The living body is continually losing matter and expanding energy. So long as we regard it as working by virtue of some vital force, the power of generating which it has inherited, the waste is difficult to account for, since it is far more

than we can imagine as due merely to wear and tear of the working parts. When, however, we consider the nature of the income of the body, and of its expenditure, from a chemico-physical point of view, we get the clue of the puzzle. The body does not waste because it works, but works because it wastes. The working power is obtained by chemical changes occurring in it, associated with the liberation of energy which the living cells utilize; and the products of these chemical changes being no longer available as sources of energy, are passed out. The chemical changes concerned are mainly the breaking down of complex and unstable chemical compounds into simpler and more stable ones, with concomitant oxidation. Accordingly, the material losses of the body are highly or completely oxidized, tolerably simple chemical compounds; and its material income is mainly uncombined oxygen and oxidizable substances, the former obtained through the lungs, the latter through the alimentary canal. In energy, its income is the potential energy of uncombined or feebly combined elements, which are capable of combining or forming more stable compounds, and its final expenditure is vinetic energy, almost entirely in the form of mechanical work and heat.

"Given oxygen, all oxidizable bodies will not serve to keep the body alive and working, but only those which (1) are capable of absorption from the alimentary canal and (2) those which are oxidizable at the temperature of the body under the influence of protoplasm. Just as carbon and oxygen will not unite in the furnace of an engine unless the fire be lighted by the application of a match, but when once started, the heat evolved at one point will serve to carry on the conditions of combination through the rest of the mass, so the oxidation of the body only occurs under special conditions; and these are transmitted from parent to offspring. Every new human being starts as a portion of protoplasm separated from a parent, and affording the conditions for those chemical combinations which supply to living matter its working power; this serves, like the energy of the burning part of a fire, to start similar processes in other portions of matter. At present we know nothing in physiology answering to the match which lights a furnace; those manifestations of energy which we call life are handed down from generation to generation, as the sacred fire in the temple of Vesta, from one watcher to another. Science may at some time teach us how to bring the chemical constituents of protoplasm into that combination in which they possess the faculty of starting oxidations under those conditions which characterize life; then we will have learned how to strike the vital match. . . . How the vital spark first originated, how molecules of carbon, hydrogen, nitrogen, and oxygen first united with water and salts to form protoplasm, we have no scientific data to found a positive opinion upon, and such as we may have must rest upon other ground. . . .

"The human body, like that of other animals, is, on the whole, chemically destructive; it takes in highly complex substances as food, and eliminates these elements in much simpler compounds, which can again be built up to their original condition by plants. Nevertheless the body has certain constructive powers; it at least builds up protoplasm from proteids and other substances received from the exterior; and there is reason to believe it does a good deal more of the same kind of work, though never an amount equaling its chemical destructions. Given one single proteid in its food, say egg albumen, the body can do very well; making serum albumen and fibrin factors out of it for the blood, myosin for the muscles, and so on; in such cases the original proteid must have been taken more or less to pieces, remodeled, and built up again by the living tissues; and it is extremely doubtful if anything different occurs in other cases, when the proteid eaten happens to be one found in the body. In fact, during digestion the proteids are broken down somewhat, and turned into peptones; in this state they enter the blood and must again be built up into proteids, either there or in the solid tissues. The constructive powers of the body used to be rather too much ignored. Foods were divided into *assimilable* and *combustible;* the former serving directly to renew the organs or tissues as they were used up, or to supply materials for growth; these were mainly proteids and fats; no special chemical synthesis was thus supposed to take place, the living

cells being nourished by the reception from outside of molecules similar to those they had lost. . . .

"Several facts may be urged against this need: (1) Men in tropical climates live mainly on non-proteid foods, yet their chief needs are not heat production, but tissue formation and muscular work. (2) Carnivorous animals live on a diet very rich in proteids, nevertheless developing plenty of animal heat, and that without doing the excessive muscular work which, in Liebig's theory, must first be gone through in order to break up the proteids, with the production of a non-azotized part which could then be oxidized for heat production. (3) Great muscular work can be done on a diet poor in proteids; beasts of burden are for the most part herbivorous. (4) Further, we know exactly how much energy can be liberated by the oxidation of proteids to that stage which occurs in the body, and it is perfectly possible to estimate pretty accurately the amount of urea and uric acid excreted in a given time; from this sum the amount of proteid oxidized and the amount of energy liberated in that oxidation can be calculated: if this be done, it is found that nearly always, the muscular work done during the same period represents far more energy expended than could be yielded by the proteids broken down."

It is proven also that proteid oxidation is not the source of the mechanical energy expended by the body. Martin's conclusion is, "that a muscle works by the oxidation mainly, if not entirely, of carbon and hydrogen." . . . "Speaking broadly, the work of the body is carried on by the oxidation of carbon and hydrogen."

Synthesis and Analysis. — In 1828, Wöhler obtained urea by evaporating ammonium cyanate, and since then many synthetic compounds have been formed by chemists. Hippuric acid is formed by bringing together molecules of simpler constitution to form a more complex body. Berthelot obtained formic acid by heating carbon monoxide with potassium hydrate at 100° C. This was building up an organic compound from inorganic sources. Kolke formed acetic acid from carbon disulphide-synthesis, or the formation of organic compounds from inorganic materials is effected in nature by the agency of the vegetable kingdom. As Rolfe says, "The plant under the influence of the rays of the sun, liberates a quantity of oxygen from inorganic constituents, such as carbonic acid, water, and ammonium carbonate, which exist in the soil and air, converting them into those saccharine, oleaginous, and albuminious principles which form its tissues and juices, and which ultimately furnish the animal world with food. For example, carbonic acid by deoxidation under certain circumstances may yield mannite: thus $6\,C\,O_2 + 7H_2\,O - 130 = C_6\,H_{14}\,O_6$."

The vegetable organism is chiefly employed in building up *synthetically* inorganic into organic matter, while the animal *analytically* reduces organic compounds back again to their original inorganic constituents.

Oxidation and Fermentation. — While asserting in a general sense that the processes going on in the animal body are finally analytic, still certain synthetic processes do occur, as for instance the conversion of carbo-hydrates into fat, and the elevation of the proteids and peptones into tissues of a more complex form. The downward transformation toward carbonic acid and urea, which non-nitrogenous and nitrogenous substances undergo, and to which the term *metabolism* has been applied, has been the subject of much study.

The view now generally received is that increased metabolism is not the result of increased oxidation, but it is the increase of the inter-molecular action in the cells themselves that occasions the demand for oxygen, and a more active condition of circulation and respiration. In fever, the earliest step is the increase of intra-molecular changes in the cells themselves under the stimulus probably of the zymotic poison; for when the stored-up oxygen is exhausted, then a demand for a fresh supply causes an increased frequency of pulse and respiration, which continues so long as the stimulus (zymotic) acts on the cells and maintains this abnormal intra-molecular activity.

Intensity and Chemical Action. — Helmholtz (see Barker's chemistry) regards each atom of matter as charged with a definite quantity of electricity, these charges being proportional to the valence of the atoms. Thus all univalent atoms have unit charge, all bivalent atoms a charge of two units, all trivalent atoms a charge

of three units, and so on. Moreover, he conceives, *First*, That the same atom in different compounds can be charged with units of either positive or negative electricity; sulphur, for example, being in hydrogen sulphide a negative substance, and in sulphurous oxide a positive one. And, *Second*, That their electrical charges are held more strongly by some atoms than by others; an atom of zinc, for example, holding its positive charge more strongly than an atom of copper does its negative one. Further, an electrically neutral molecule, whether simple or compound, will have each unit of positive electricity, or one of its atoms neutralized by an equal unit of negative electricity or another atom. As to the magnitude of these atomic charges, Helmholtz calculates that they must be enormous. "The electricity of one milligram of water," he says, "separated and communicated to two balls a kilometer distant, would produce an attraction between them equal to the weight of 26,800 kilograms," or, comparing the electrical attraction between two quantities of oxygen and hydrogen with their gravitational attraction, he finds the electrical face to be 71,000 billion times greater than the gravitational force. Faraday said: "The mightiest among the chemical forces are of electric origin."

(To be continued.)

MICRO-ORGANISMS OF THE MOUTH.[1]

BY JOHN H. LINSLEY, M. D.

Prof. of Pathology and Bacteriology, Medical Department University of Vermont, Pathologist to the New York Infant Asylum, etc.

(Concluded.)

DENTAL CARIES.

It has been proven, beyond doubt, that decay of the teeth is caused by two different processes, namely, (a) chemical, (b) parasitical. The first is a decalcification of the enamel, or dentine, or both, caused by the presence of acids in the mouth, which have been formed from the fermentation of starchy and saccharine substances, resulting in a softening of these tissues, after which these latter form an excellent food-medium for many varieties of bacteria. The prevention of dental caries depends, first of all, upon strict cleanliness of the mouth, the importance of which cannot possibly be overestimated; the details necessary for the proper fulfillment of the same, it would be superfluous for me to suggest to you. Undoubtedly good stiff tooth-brushes and plenty of clean water stand at the head of all measures of this nature. The next prophylactic means is the intelligent use of proper antiseptics.

By far the most perfect germicide known, that can be at all employed in this connection, is the bi-chloride of mercury, but the use of this substance is not without danger. It should not be used as a wash for the mouth in solutions of greater strength than 1 : 2000, and even then, care must be exercised in its application. Other antiseptics which have been recommended for the buccal cavity, are salicylic acid, strength of 1 : 200, or 1 : 350, listerine, wintergreen oil, and like aromatic substances.

In this connection might be noted the germicidal properties of tobacco, either the juice of the leaf or the smoke of the burning leaves. Certain it is, from results obtained by many experiments and observations, that tobacco-juice or smoke, very speedily destroys bacterial life, but I would not, on this account, advocate its use, as the evil results of excessive indulgence in the "weed," more than counterbalance any possible benefits resulting from its antiseptic action on micro-organisms of the mouth.

In discussing the subject of infection, attention should be directed to the danger which exists from the spread in various directions of infectious forms of bacteria, that are liable to be present in the mouth. It is not difficult, under certain circumstances, to excite an inflammatory process in the middle ear, the transmission of septic germs taking place through the eustachian tubes; similar results may also occur from pyogenic bacteria being carried from the mouth to the throat, lungs, parotid gland, antrum, and even to the brain, as stated by Bergtold. When it is considered, that of all diseases of a parasitic nature to which mankind is susceptible, dental caries is by far the most frequent, the possiblilities I have just mentioned, cannot be charged as being the improbable and unlikely speculations set forth by one who is "cranky" on the subject.

[1] Paper read before the annual meeting of the Vermont State Dental Society at Burlington, Vt., March 17, 1892.

Upon reviewing the various literature on this question, especially those portions of it which refer to the dangers of infection between the dentist and his patient, the speaker was much surprised to find no advice offered to the dental profession by competent bacteriologists, as to the considerable (and ofttimes great) danger present to the patient, by pathological conditions the dentist himself may be suffering from at the time of operating, and to point out the necessity of establishing, by legislative measures if required, laws or statutes which would prevent the occurrence of such dangers.

I refer, more particularly, to the jeopardy in which human life is placed when people are subjected to treatment by a practicing tubercular dentist. This may seem, to many of you, as a bit of superfluous advice, and you may retort that such a circumstance is beyond the bounds of possibility, but I assure you I have seen a tubercular member of your profession practicing daily on unsuspecting or ignorant patients.

My experience with dentists has been very limited, and therefore I am not in a position to make any assertion as to the frequency of such pernicious and dangerous proceedings; but the very fact that my slight personal observations resulted in the detection of one such case, naturally suggests a possible more common occurrence of tuberculosis in practicing dentists than might be supposed. Since commencing the work incident to the preparation of this paper, one of the local members of your profession has detailed another case, which was under his own personal observation, of a tubercular practicing dentist.

The greatest danger, under such circumstances, is not, as some of you might imagine, in the infection of the patient by the transmission of germs through the medium of the breath of the operator, but in the reception of tubercular material which becomes dry on the handkerchiefs, clothing, linen, or instruments of the dentist. The prevention of such dessication is so extremely difficult and impracticable, as to be discarded without serious consideration if such prevention be presented as a possible prophylactic measure, to enable the victim of this malady to continue his professional work until physically unable to do so on account of the inroads of the disease. It is not generally known that bacteria do not float in the atmosphere in the moist state, but only do so after desiccation, and then probably to no great extent, unless aided by more or less strong currents of air.

Tuberculosis is now almost universally considered to be an infectious disease, and of so contagious a nature that I candidly believe we shall, many of us, see the day when attention to preventive measures against possible infection from cases of this disease, is as regularly insisted upon as are the sanitary requirements in cases of smallpox, yellow fever, and typhus fever (with the exception of somewhat less vigorous quarantining) at the present day. The period in which to accomplish this much-desired treatment of tubercular cases, will depend upon the rapidity with which the laity, and professional men even, become educated to the full comprehension of the single and sole cause of the affection,—the tubercle bacillus,—and the proper realization of the benefits to be derived from the adoption of such measures. And to the intelligent efforts and advice of the members of the medical profession, as well as to the great aid which you, members of the dental profession, can give, by embracing each and every opportunity to inform your patients, especially influential citizens, as to the true character of tuberculosis, must the accomplishment of this end very largely devolve.

Of all the various ways by which tubercle bacilli find entrance into the human body (such as from the surface of the skin through wounds, by contusions, cuts, or otherwise; from the ingestion of milk and flesh from tubercular cows and animals, etc.), infection by inspiration,—by the entrance of the dried germs through the mouth, and so on to the lungs,—far surpasses in frequency, all other methods of transmission. And this can only be accomplished when the medium on which the micro-organisms have been discharged from the body, dries, or disintegrates, into powder or dust. For this reason the most dangerous source of infection is from handkerchiefs or cloths on which the sputum has been received (unfortunately a too common procedure), and on which it becomes dry in an exceedingly short time. Consequently by merely preventing the sputum of consumptives from

drying, the most important kind of infectious matter may be rendered harmless.

The first contradiction I have seen, by competent pathologists (who acknowledge the tubercle bacillus as the essential cause of tuberculosis) to the statement that the commonest source of infection is the inhalation of dried bacilli from handkerchiefs, linen, clothing, dust from the floors and ceilings of rooms previously occupied by tubercular subjects, etc., was recently made by Dr. J. West Roosevelt, of New York.[1]

Dr. Roosevelt maintained that "there was much more likelihood of getting an overdose of the virulent germs" of tuberculosis "through the alimentary tract, either by the ingestion of meat, milk, or, in children, by putting articles of every nature into their mouths, no matter where they may have lain," than by the manner which I have just described. While recognizing the value of the opinion of so able an authority as Dr. Roosevelt, I am convinced that his statement will not be corroborated by the majority of pathologists and bacteriologists in this country or on the continent. True it is, that much needless alarm may be created in the minds of the public, by the advocacy of too severe and unnecessary measures of prevention, such as quarantining, etc., by prejudiced and over-zealous investigators, the effect of which would be the unjustifiable persecution of many poor victims of tuberculosis, and as I just suggested, the only proper course to pursue in dealing with this question, is to persistently and intelligently educate the minds of the public, as to the exact status of this matter.

Few pathologists, at the present day, believe in the theory of heredity as a cause of tuberculosis. It is a fact that the offspring of afflicted parents often regularly develop, sooner or later, the disease, but the explanation is to be sought in a general impoverished condition of the organism, as indicated by enfeebled assimilative and nutrient powers, which are quite sure to follow as the inheritance from unhealthy progenitors.

What I have just said in regard to transmission, naturally leads to the most interesting and important problem in bacteriology, namely, that of immunity, and I ask your indulgence for a few moments, in order to state the theories at this time held in regard to this subject.

As you are all probably aware, two principal views are advanced to account for the difference of susceptibility possessed by different animals to the same micro-organism, and also that exhibited by the same animal to different germs.

I might state here, that immunity is of two principal kinds, to wit, (*a*) *natural*, or inborn, (*b*) *acquired*, or artificial.

The first of the theories of natural immunity is based on the chemical germicidal properties of the blood-serum and tissue-juices of the body. The second, or Metchnikoff's theory, attributes the resisting power which an individual or animal may possess, to the so-called phagocytic action of the tissue-cells of the body, more especially the colorless corpuscles, or leucocytes, of the blood.

Metchnikoff believes that the presence or absence of immunity depends on the ability or inability of the cells of the body, to devour and destroy the bacteria. Such ability may be natural or acquired. In the latter case, the cells, where they have once had the opportunity of devouring attenuated micro-organisms with a milder poison, which nature enables them to withstand, are so far accustomed to it, that they can devour the most virulent material with impunity. This can be effected both by gradual adaptation, and also by a kind of selection, in which only the strongest, most vigorous cells remain, and transmit the acquired faculty to their descendants. The leucocytes are but short-lived cells. A permanent resistance of the organism to a disease which it has once had, or against which it has been protected by inoculation, is, therefore, only conceivable if we grant to the cells the power of transmitting an acquired property unaltered to their children and their children's children.

This hypothesis,[2] as must have been seen, presupposes an extraordinary docility in the protoplasm of the white blood-corpuscles, to which it atrributes something like feeling, thinking, and acting,—a sort of mental perception. But if we raise no objection to this, there remain plenty of reasons for combating the phagocytic theory of immunity.

[1] New York *Acad. of Med.*, Feb. 4, 1892, *vide Medical Record*, Vol. 41, No. 10.

[2] "Text-Book of Bacteriology," Fraenkel, translated and edited by Linsley — 146 pp.

In our opinion, the fact that it is essentially the excretions of the bacteria which produce, or are able to produce, immunity, is difficult to harmonize with Metchnikoff's hypothesis; for, if no living micro-organisms are present, none can be devoured, to accustom the cells to the poison, and prepare the way for resisting more virulent successors. To overcome this difficulty, it would be necessary to suppose that the reception of attenuated germs acts upon the cells only as a specific stimulant, to which they respond by a functional reaction, and that this stimulating power exists in the same degree, and works in the same manner, also, in the bacterial products.

The theory of the germicidal action of the blood-serum, or plasma, is, I believe, supported by more weighty authority than is the ingenious one of Metchnikoff.

I have thus forsaken the exact theme of my discourse from a belief that more benefit would be derived from the brief treatment of a subject, at best only partly understood by the highest authorities in this branch, but which one who has devoted much time to practical investigations, must necessarily be better qualified to handle than the average practitioner.

As yet, we are only on the frontier of the domain of bacteriology, and have only obtained comparatively few facts, or details, of this most interesting and important kingdom.

What data and facts, investigations into the interior of this boundless area of unexplored territory of micro-organic life, will place us in possession of, time, perseverance, and unremitting efforts will prove. We certainly have reason to believe that the knowledge of such points, at present undiscovered, together with their practical application, will be of inestimable value to mankind.

PHYSIOLOGICAL MEDICINE.[1]

BY PAUL PAQUIN, M. D.

THE practice of medicine comprises two different departments: *First*, the science of medicine; that is, the study of the sciences upon which the physician bases his preventive or curative treatments; *second*, the art of medicine, consisting of the application of measures to prevent and to cure diseases. It is self-evident from the very nature of things, that knowledge of the science must precede the study of the art. It is indeed essential for the greatest success in the practice of medicine, that the most important scientific branches upon which it is based be well understood. It is true that numerous practitioners have neglected the scientific branches, and by years of observations and experimentation in their daily work, are looked upon as quite successful, professionally and financially. It is true that a good number of medical men have devoted themselves, in their younger days while at college, and later while in practice, chiefly to the therapeutical field. It is true also that a great number of the profession have all their lives practiced medicine with stereotyped formulas, scarcely ever varying in any given condition, or in any special condition in which they thought they understood the trouble.

But all these facts do not prove that such practice is satisfactory, wise, just, and really as successful as it appears. It must be borne in mind that the reputation of a physician depends sometimes as much on his personality, his character, his behavior, his tact, as on his medical knowledge and professional success.

For centuries, medicine has been practiced largely according to stereotyped rules suggested from time to time in various countries by the leading authorities of the profession. We have, as a rule, been content to limit our endeavors very largely to the administration of drugs,—relying on the text-books on materia medica and therapeutics which gave us to understand the direct effect of this and that medicament, as had been realized or guessed by observation, and a little by experimentation. Until recent years, very little account had ever been taken by the average practitioner, of the physiological effects of the organs of the body on the medicinal substances, and very little thought has ever been given to the effects that an association of drugs may have in the system from chemical and physiological standpoints, and still less attention has been paid to the transformations that may take place in the drugs and tissues brought in contact in the body and with the substances created

[1] Paper read before the Missouri State Medical Association at Pertle Springs, Mo., May 18, 1892.

during the process of digestion, metabolism, and the generation and growth of micro-organisms in the alimentary canal.

Under the low standard of medical education which has existed so long, this system of practice was necessarily the only equipment for the young practitioner, who had attended only two or three short terms of medical studies before fitting himself for conflict in the medical arena, and it is still the case for a vast number of graduates. They are not prepared by scientific knowledge to do anything better than to follow as closely as possible in the footsteps of those who offer the simplest means of relief from embarrassment in the various conditions that they meet in practice. They see a patient, find a fever, diagnose the case according to the best of their ability, then turn to a formulary, printed or memorized, prescribe, and feel that they have done their duty. The prescription may or may not have a good effect; it may be harmless, or it may be harmful; it may hasten recovery, or it may hasten death. In either case, the physician thinks that he has done the best possible, and he feels that his conscience is clear. During the last twenty years' scientific experiments and observations by advanced thinkers in the medical world have pointed out to us the fact that such practice is little better than empiricism. It really constitutes to-day, a passing stage in the various phases of the evolution of the science and art of medicine, and those who still cling to it and practice medicine as a trade, are behind the times.

Not many years ago, attempts to treat diseases by any other means than the administration of drugs was termed quackery. Electricity, massage, hydrotherapy, Swedish movement, and balneology were considered irrational means of treatment, beneath the dignity of the physician. So-called water-cures were laughed at; dietetics were considered of secondary importance; in fact the laws of nature governing man's structures and activities were scarcely taken into consideration, and the practice of medicine was based mostly on the orthodox principles and practice of medicine and materia medica.

We are happy to see a most important change in the thought of the medical profession in this respect, and in the practice of physicians throughout the world. A few physiologists, untiring in their efforts to demonstrate the sublime truths underlying the life of the masterpiece of nature's organisms, have brought to bear an enormous amount of weighty facts upon which we can now begin to base more logically and with more hope our efforts to benefit humanity in the prevention and cure of maladies. The physiology of the unicellular organisms is now studied as accurately as the physiology of man himself, and the relations that exist between the lower organisms and the higher types are boldly brought forth before the astonished world. Even each cell of man's body, or at least each set of cells, is closely scrutinized, sharply questioned, if I may so speak, and often forced to give up their secrets to the human race. So we are at last in a condition to base our treatments on a clearer understanding of human nature, and the laws underlying the vital functions of its wonderful organization.

The medicines given to-day by advanced medical practitioners, the thinkers of the profession, are not so often composed of a half dozen, sometimes a dozen medicinal agents mingled together with the object of "hitting the nail" somewhere, but are simplified, and only one or two pure specific drugs, such as alkaloids, are administered with an almost positive knowledge of the direct effect of that particular ingredient in the system.

Understanding more and more the intricacies of digestion, the complexity of the phenomena that take place in the dissolution and transformation of foods in the stomach and lower intestines by the action of the natural secretions and microbic life; having grasped the nature and importance of the action of the liver on the substances which enter into the blood, such as poisons administered from the outside or generated in the body by the cells of the body itself or the cells of microbes; realizing, finally, the possibility of producing serious irritations and inflammations in various organs, notably the kidneys, by the action of products manufactured in the digestion of certain foods, dietetics are now considered more wisely and more seriously in the practice of medicine. The good physician no longer starves his patient on general principles because he wants food, or crowds him with nourishment when he does not want it, cannot

digest it, and cannot assimilate it; he seldom now administers foods without knowing, in some degree, their properties and effects, but reflects before feeding, on the possible result of the ingestion.

In the matter of dress, also, there is a wide awakening to the necessity of improvement. This awakening, however, has not come primarily from the medical profession; it has been suggested by dress-reformers outside of our ranks, by women who have thought deeply on the subject, and whom the profession finds right in a great many things. The constricting corset — almost severing the liver, preventing its exceedingly important action in the economy, interfering with the natural flow of the circulation, compressing the lungs upward, and limiting respiratory action to a narrow space, crowding down the intestines and the organs of generation into the pelvis — is gradually disappearing from woman's wardrobe in a great many localities, and giving place to the loose waist. The physician cannot but hail with approval this great reform.

In the treatment of various fevers, even those due to specific organisms, more rational agencies are now used, because of our knowledge of the action of the micro-organisms and the reaction of the body upon them. Realizing the conditions in which the warrior-cells (the phagocytes) and the microbicidal substances of the economy may act, the system is no longer jeopardized as heretofore by a constant administration of drugs (given too often without knowing their effect), nor is it starved injudiciously by forced fasting and forced abstinence from drink, as was sometimes cruelly practiced, nor do we rely exclusively on quinine or any of the antipyretics, but, instead, baths are very frequently used with decided benefit. In typhoid fever, for example, the cold-water bath is now used with great success. Doctors Brand, Leibermeister, Winternitz, Ziemssen, and many others in European countries have used Bouchard's baths, and testify to the truth of this statement.

In dyspepsia, too, treatment is based more and more on the knowledge of the physiology of digestion. Drugs counteracting fermention or intended to soothe pains, are relegated to past nostrums, and physical treatment, either by Winternitz's hydropathic stomach-cure, or various other heating or cooling stimulating packs are employed, whereby fifty-six per cent are healed, whereas not eleven per cent were cured before.

So medical progress is made in the line of physiological medicine: that is to say, the practice of medicine is becoming more and more based on the knowledge of physiology,— not merely the physiology of the most important organs in a general sense, but the deep physiology of every organ, every cell of every organ and every product of every cell of every organ. The therapeutical means based on this knowledge are also in a high degree themselves of a physiological character; they are not merely drugs whose effects are such as to produce this or that chemical reaction or change, whereby sometimes another disease is brought about, or a complication worse than the original disease (or at least as bad) is set up, but rather, in the assistance of the natural physiological efforts of the system to restoration. Given a case of paralysis, for example: the advanced physician who is an expert in nervous diseases, does not rely on the administration of drugs which have the effect of producing contractions or spasms of the muscles, but puts his patient in the most favorable condition possible to allow the normal action of the nervous system on the body, and for the response of the muscular system thereto; and his therapeutical means consist largely of gradual, wisely limited, and cautious stimulations of a physical character, such as electricity, massage, Swedish movement, hot and cold applications to the spine, etc., etc., most of which, some years ago were considered unworthy of confidence, and were found chiefly in the hands of charlatans, being used without scientific or other than general knowledge of their action.

This paper was written to bring to the minds of the medical profession a suggestion, and that is, that even now, at least in the smaller centers, we depend too largely on drugs, and study the physiological means of the prevention and cure of disease too little.

Modern Treatment of Furuncles.— Spohn recommends cotton compresses saturated with the following solution: Hydrate of chloral, 1 dr.; aqua, glycerine, aa, 4 dr.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE LIVER AS AN ORGAN OF ASEPSIS — CLINICAL AND THERAPEUTICAL CONSIDERATIONS.[1]

BY DUJARDIN BEAUMETZ,

Member of the Academy of Medicine, Physician to the Cochin Hospital, Paris.

Translated by J. H. Kellogg, M. D.

(Concluded.)

I WILL now pass to the therapeutic conclusions which follow from the facts which I have presented.

In diseases of the liver or any infectious maladies of whatever origin, it is of the first importance to maintain in its integrity the ability of the liver to destroy the toxines; we ought even to seek to increase its activity in this respect. To accomplish this, two classes of means may be employed :—

1. To increase the glycogenic function of the liver, since, according to the results of physiological experiment, there is an intimate correlation between its glycogenic and its antiseptic function.

2. To restrict, as much as possible, the sources of poisoning of the organism so as to reduce to a minimum the quantity of toxines which the liver must destroy.

Let us examine each of these points; first, as regards the augmentation or the increase of the glycogenic functions of the liver; and I shall dwell upon this point in another lesson,—that the glycogenic function of the liver is diminished by abstinence from food and elevation of bodily temperature. With regard to abstinence, it is necessary that a patient suffering from febrile disturbances and disturbances of the liver should receive as nourishing food as possible. It is well to be highly nutritious, but it must fulfill certain conditions of which I will speak in connection with the second point under consideration, namely, the suppression of the causes of poisoning of the system. We shall see, in fact, in relation to this point, that food is one of the most active sources of this poisoning.

To the necessity of properly nourishing the febrile patient is joined another necessity, that of lowering his temperature. In looking at the matter exclusively from the point of view of the antiseptic function of the liver, it is necessary to combat abnormally high temperature. We may accomplish this double object, either by baths, cold or warm,—preferably warm baths in my judgment,—or by the employment of a group of medicinal agents belonging to the aromatic series. But these drugs present the disadvantage of diminishing the urinary secretions and thereby diminishing the excretion of the toxines.

In his experiments, Roger seems to have demonstrated that glucose, of itself, modifies the toxicity of vegetable or organic alkaloids. We may from this fact, draw the conclusion that sugar, and glucose in particular, might be advantageously utilized in infectious diseases, and that it might be necessary to add sugar to the drinks of patients suffering from these affections. But this is a point which requires further investigation.

Still more important is the great question which I now approach, that of restricting, as much as possible, the sources of infection of the system. One may say that in all affections of the liver, no matter of what sort, this precept applies.

In the preceding lesson, I have shown that the animal toxines have four origins: They are found in the foods introduced into the digestive tube; they result from the fermentations which occur at different periods of the digestive act; they are secreted by microbes which abound in the intestinal tube; finally, they result from the activities of the cell life of the body.

To these four origins, it is necessary to add a fifth, a pathological or therapeutic origin, — toxines manufactured by the microbic cause of infection, in that group of diseases to which I have given the name of toxi-infections.

We sometimes administer poisonous alkaloids with a curative object.

In the treatment of all patients suffering from affections of the liver, it is necessary to use great caution in the administration of alkaloids by the mouth, and particularly as regards certain alkaloids, such as morphia, quinine, and

[1] A series of lectures delivered by Prof. Dujardin Beaumetz, published in the *Bulletin General Therapeutique*, and translated expressly for this journal.

atropia. Only the hypodermic method should be employed, since it has been demonstrated that the special destructive action of the liver upon vegetable alkaloids is lessened or absent when the liver is diseased, so that poisoning by therapeutic doses of the alkaloids is likely to occur when these drugs are administered by the mouth.

As regards the other causes of infection which I have enumerated above, we are able to combat or lessen them by three classes of means: 1. By intestinal antisepsis. 2. By encouraging the elimination of the toxines. 3. By diminishing the cellular activity. Let us study each of these means.

Intestinal antisepsis, which constitutes the basis of this special method of medication, comprehends in itself three classes of means: antiseptic drugs, purgatives, and lastly, alimentary regimen. At the head of antiseptic drugs must be placed salol and salicylate of bismuth. I have already given in my "*Nouvelles Medicationés*" (2nd series), the reasons which have led me to consider salol as the best medicinal antiseptic.

I shall content myself with a brief *résumé* of the reason for this preference: Salol is but slightly irritant, and always well supported by the digestive organs. It is but slightly soluble and decomposes into phenic and salicylic acids only in the alkali medium; that is to say, in the intestine. If I add that this salicylate of phenol is relatively but slightly toxic, I shall have demonstrated the superiority of salol over iodoform and napthol heretofore employed, and which are always toxic and irritant.

I place salicylate of bismuth on nearly a par with salol. It agrees well with both the stomach and the intestine. I utilize the two substances in the form of tablets, of which the following is the formula: Salol, salicylate of bismuth, bicarbonate of soda, āā 2½ drams. Divide into 30 tablets.

As to the napthols, I have not abandoned them, but I have utilized them in enemas, employing large enemas with one quart of the following solution: Napthol *a*, 75 grains. Divide into 20 powders. Dissolve each powder in one quart of water.

I prefer napthol *a* to napthol *b*, because it is more soluble and more active, being at the same time less toxic. I am aware meantime that napthol *a*, is more irritating than napthol *b*, but in a dose of three grains to the quart of water, these irritating properties are extremely slight, and in the great majority of cases this solution is well borne.

To introduce the solution I do not use an irrigator, but recommend a very simple enteroclyster, which has been constructed for me by Galante,—a fountain syringe with long rectal tube.

The manipulation is as simple as possible. One introduces the tube into the rectum as high as possible, then introduces the liquid slowly, keeping the patient in a horizontal position. It is of course understood that the liquid introduced is not to be retained, but must be discharged almost immediately.

So much for medicaments. I pass now to the purgatives. Purgatives are useful only when there exists constipation which resists the enemas of napthol solution, of which I have spoken. In these cases it is necessary to employ laxatives.

You may use cascara and its extract cascarina, as well as all the purgative waters, and particularly Spanish waters, which, owing to the large quantity of mineral matter which they contain, may be administered in small doses in the morning before eating. Such are the waters of Rubinat, of Caravana, and of Villacabras.

The alimentary regimen plays a preponderant role in the therapeutic group to which is given the name of intestinal antisepsis. Here is the triumph of the vegetarian regimen.

The regimen which I defend, and which you will find presented in its entirety in the recent work of Dr. Bonneloy on vegetarianism, is composed, as you know, of eggs, milk, farinaceous substances, green vegetables and fruits, and to enable you to keep well in mind this regimen, I here reproduce the formula: The patient should be nourished exclusively by milk, eggs, farinaceous substances, green vegetables, and fruits. *a*. Take at least one quart of milk a day. *b*. Eggs may be taken in all forms. *c*. Farinaceous foods should be taken in the form of puree,—puree of potatoes, of beans, of lentils, milk porridge, gruels, porridges of wheat, rice, barley, maize, oatmeal, and macaroni. *d*. Green vegetables should be very well cooked. (Puree of carrots, cooked salads, peas and green

beans.) *e.* Fruits should be cooked, with the exception of strawberries and grapes.

If the patient insists upon eating meat you should permit only well cooked and gelatinous meats.

You should forbid fish, game, mollusks, snails, and cheese, because of the toxines which are rapidly developed by putrefaction in these foods.

You should also forbid fat broths, and give the preference to lean soups; the potash contained in bouillon (beef tea, meat broths, etc.) is noxious to the glycogenic functions of the liver and also to its antiseptic functions.

You may permit sweetmeats and confections. You have seen in the preceding lesson that sugar aids hepatic antisepsis.

So much for intestinal antisepsis. The second indication to fulfill is to eliminate the toxines formed in the system; and this you will accomplish by encouraging diuresis by the free employment of slightly alkaline drinks, or by making use of milk. You should have care, in addition, to encourage the action of the skin, recommending ablutions with warm water to which cologne water has been added, and even soap for oily skins, following the baths with energetic friction with a horsehair glove.

Finally, to diminish the leucomaines resulting from the organic work of the cells, you will remember that exaggerated work increases in notable proportions the production of toxines, and by the expression "exaggerated work" I mean not only muscular but intellectual work.

Thus overwork, which is the cause of the accumulation of toxines, must be absolutely forbidden.

Such is the summary of the therapeutic and hygienic means which should be employed. It remains for me to indicate, in conclusion in what cases we shall be able to apply these curative measures.

We have seen that there is correlation between the glycogenic functions of the liver and its antiseptic functions. When I speak of the glycogenic functions of the liver I shall endeavor to demonstrate that the integrity of the glycogenic function is itself equivalent to the integrity of the physiological functions of the liver. The liver can only act upon the poisons when in a state of health.

This first conclusion admitted, the second immediately follows. It is that all the affections of the liver will modify to a greater or less extent its antiseptic action, and when these affections are accompanied by lesions sufficiently profound to destroy the hepatic cell, this antiseptic function will be destroyed.

Then, in all affections of the liver, we should employ the means which I have indicated, since this protective barrier established between the intestine and the rest of the body is more or less destroyed.

But while diseases of the liver require on the part of the physician an antiseptic plan of treatment, still more do intestinal affections, and especially those which are accompanied by putrid fermentation, require the same method of treatment to prevent disease of the liver consecutive to intestinal putridity. Bouchard, in fact, has shown that in all patients affected or suffering from dilatation of the stomach, to which it is necessary to add those suffering from dilatations of the large intestine, as Trastour and Malibran have shown, there were intermittent hepatic congestions.

These congestions result from the exaggeration of the antiseptic function of the liver, by which the destroying action upon the poisons is very greatly increased in consequence of the augmentation of the production of intestinal toxines. When one follows these cases of dilatation of the stomach or of intestine, he observes these congestions following digressions from the proper regimen, or the abandonment of antiseptic medication.

In presenting to you the subject of dilatation of the stomach and gastric neurasthenia, I have shown that this congestion of the liver explains in these patients the renal displacement.

Finally, in infectious maladies with putridity, to avoid hepatic complications it is necessary to employ the same plan of treatment.

In conclusion, do not forget that if the liver is a destroyer of poisons, it also produces, especially in certain species of animals, a very active toxine. You are all familiar with poisoning by shellfish. It is produced by the toxalbumin secreted by the liver,—mitylotoxine. When I speak of the biliary function of the liver, and of urticaria of hepatic origin, I hope to

demonstrate that man also produces, when the liver has been affected, a toxine analogous to mitylotoxine, and which produces, when the bile which contains it is absorbed by the intestinal mucous membrane, urticaria of variable intensity. Here, also, for the cure of these urticaries of toxic origin, the intestinal antisepsis which I have explained must be applied.

In the next lecture I shall study with you, the liver as a bile-making organ.

INTRA-CELLULAR PARASITISM OF CANCEROUS NEOPLASMS.

BY M. SOUDAKEWITCH,

Prosector of the Institute of Pathological Anatomy, Kieff, Russia.

Translated, from *Annales de L' Institut Pasteur* by Paul Paquin, M. D.

(See Frontispiece.)

An observing person initiated into the pathogenesis and the microscopical tableau of the different infectious maladies, does not easily admit that microbes play a part in the etiology of the development of epithelial and connective neoplasms. Ordinarily, in fact, microbes do not construct; they destroy. The neoplasms encountered in microbic diseases, are constituted only by leucocytes and other mesodermic phagocytes.

In none of these affections do we observe progressive modifications of the tissues, such as epithelial tissues, for example, and if, in some affections of the skin, as leprosy, cutaneous tuberculosis, we observe an intense development of the papillary layer, it is not to the direct influence of bacteria that it is due. Microbes seem to evade epithelial tissue.

The role of microbes in the development of acute condylomas (*condylomata acuminata*) is not well established.

It is not astonishing, therefore, that bacteriological researches have not given positive results on the subject of the etiology of carcinomas; the labors of Nedophile, Scheurlein, and Koubassow have not solved this question, which is therefore to be renewed.

Within the last five years I have seen descriptions grow more and more frequent of various bodies in the cancer cells. A few authors have taken these inclusions for sporozoa or organisms akin to them.

Other savants believe that these bodies are only leucocytes having penetrated into the cancerous cells, where their protoplasms undergo partial degeneration.

It is evident that we cannot deny the possibility of a partial degeneration, for instance, hyalin, fatty or mucous degeneration of the cells. The supposition of Stendener, in 1868, of an invagination of cancer cells one into another, is also perfectly plausible, particularly in view of the so rapid development of certain cancers, and the resistance of the adjoining tissues. I will nevertheless try to prove in this article, that most of the bodies inclosed as described in the cancer-cells, should be regarded as foreign products; I will say, even as true parasites belonging to the group of sporozoa.

In examining, from time to time, carcinomas operated upon in the surgical clinic of Prof. Rineck, or emanating from autopsies, I have often been able to observe, at some times, intra-cellular, and at other times, intra-nuclear bodies; they appeared as round or oval-shaped cavities, sometimes with distinct walls. Rarely, have I seen in them one or several central or eccentric granulations. In the fall of 1890, Prof. Morosoff placed at my disposal a tumor of the parotid gland, operated upon by himself. Microscopical examination demonstrated the fact that this tumor was a glandular cancer. It contained numerous intracellular and intra-nuclear inclusions; we could find often five or ten on a single visual field. These bodies had a round or oval shape, and resisting walls. Their dimensions differed from that of a mere point to that of a much larger spot. It the later cases, the nuclear substance was completely pressed back and atrophied. Unfortunately, I found no contents in these cavities (the tumor was preserved in Müller's fluid, and then in alcohol). During my sojourn in Paris, I exhibited preparations of this cancer to M. Metchnikoff, who pronounced the inclosed bodies parasites.

After my return to Russia, I began to study various cancers, particularly the glandular cancers. I first examined material from the Institute of Pathological Anatomy, preserved in Müller's fluid and alcohol, beginning with the numerous cancers of the mammary gland, examining always the lymphatic ganglia taken at the primordially diseased seat.

The sections made with Reichert's microtome were inclosed in celloidine and were colored by different methods. I employed chiefly boric-carmine, taking for a supplementary color aqueous methyl-blue, iodinized green, or hematoxylin and eosine.

I have studied, now, fifty-nine cases of cancers (of the mammary gland, of the lower lip, the lachrymal glands, the brain, the liver, the stomach, the duodenum, the œsophagus, the tongue, the testicles, and the rectum).

I have always found inclosed intracellular and intra-nuclear bodies; in certain cases they were very numerous, for example in the carcinoma of the mammary glands. In other cases, they were more scarce; there was not an example in which they were absent. On examining the preparations, I chose vacuoles inclosing contents of some sort, without forgetting the possibility of error, and of confusion as indicated above.

My observations permit me to give a plate of figures (see frontispiece) representing the clearer forms that I have observed. In order to economize space and simplify the drawings, I thought I could occasionally omit the reproduction of the bodies of the cells and their nuclei. Fig. 1 represents the first nucleus which attracted my attention. A cancerous cell of the mammary gland contained a regular spherical body which had been pressed back, and plainly compressed the nucleus. This body appeared as a bubble with resisting walls; on the anterior surface of the walls appeared small, bright, rounded grains; they were plainly visible because of the intense coloration of the walls by the hæmatoxylon. These bodies inclosed, were unquestionably strangers to the cancerous cell, and it was impossible to confound them with a nucleus or degenerated protoplasm, or with leucocytes.

The remainder of the figures are disposed on the plate (up to No. 25) according to the gradual march of the complication of their structure. Each inclosed body is provided with a more or less thick capsule. Their forms are varied, occasionally round (Figs. 2, 3, 19, 23), at other times irregular, somewhat in the order of an amœboid cell (Figs. 9, 10, 11, 12); and again, vermiform (Figs. 13, 14), or semi-lunar (Figs. 15, 16, 20). In some of them, around the amœboid bodies appears an annular layer of finely granulous substance (Figs. 17, 18). I have also observed a formation analogous to a nucleus (Figs. 15, 20, 21), and finally a true nucleus having affinity for stains, especially nuclear stains (Fig. 22). At last I found in a cancerous cell, another smaller one having a distinct capsule (Figs. 27 and 52), or they may be regarded as double inclusions (Fig. 53). The contents of the inclusions are sometimes multiple, occasionally voluminous (Figs. 31, 32), and again, very minute (Fig. 33).

In comparatively rare cases, there were two, three, and even five bodies inclosed in one cell (Fig. 28). These bodies were always smaller than when in isolated inclusions.

All the figures represented in this article, as well as in another series of observations by myself, confirm more and more my idea that the cancerous cells contain parasites.

In preparations of cancer made at different epochs and preserved in Fleming's liquid, I have found small cells in those of a cancer; they were inclosed in the interior of vacuoles with distinct walls, emanating, evidently from the solidification of the protoplasm (Figs. 29 and 30).

It was therefore necessary to await new cases and modify the method of hardening. In the month of November, 1891, my honored colleague, Dr. Fovorsky, met with (in an autopsy in the Military Hospital) an extensive carcinomatous condition of the abdominal cavity. He was good enough to put this material at my disposition; it was the pancreas, which in this case had evidently served as the primordial seat of the neoplasm. He found, furthermore, a marked cancerous infiltration of the retro-peritoneal ganglia and the lymphatic ganglia of the mesentery. The liver, the spleen, the lungs, and the small intestines contained voluminous metastasis. The lesions of the small intestines presented themselves as round ulcers with borders plainly infiltrated. There was a pronounced cancerous degeneration of the ganglia of the right flank. This tumor had the dimensions of a pigeon's egg. The anterior vena cava was plugged 1.5 centimeters, partly by a pale coagulum of the blood, and partly by a cancerous thrombus.

I preserved my material, as a rule, in Müller's liquid, but I also cut off little

pieces in the most typical and non-degenerated regions, which were divided into two parts; one was placed in Müller's fluid, the other in a solution of 1 per cent of osmic acid. I operated thus, in order to be able to compare the results of the two methods.

The pieces remained during two days in the osmic acid, and were then transferred to Müller's fluid for from three to five days. After a careful washing in water, they were transferred to alcohol more and more concentrated, until completely hardened.

The sections made from pieces which had not been included in any matter were easily colored with the old hæmatoxylon of Ranvier.

The pictures which I observed on the first preparations disappointed me. On a slightly yellowish background of the preparation one could see, besides the nuclei colored as usual, spherical and regular formations disseminated and colored pure violet, more or less intense. This coloring was exactly analogous to that produced by aniline violet.

The structure of the cancerous nodosities was perfectly typical. In the primordial seat, the picture of the sound glandular cancer was observed, while the metastasis presented a growth of connective tissue, and offered a cirrhotic character. The cancer cells were distinguished by their great dimensions; their protoplasm was normal, with fine granulations, sometimes consisting of brilliant spherical and homogeneous points. These points did not take coloring-matter; sometimes among them were dispersed a few drops of fat much smaller and colored black with osmic acid. We could observe on the preparations the progressive transformations of protoplasm in homogeneous grains. These cells which I had previously observed in other cases, had much analogy with the hyalin cells of the granulomas of the rhinoscleroma. However, the granulations of the latter were uniformly fine, and I had not observed any large gathering.

The violet bodies had very different dimensions, *i. e.*, from that of a coccus to that of the cancerous cell itself. Often, some small or large formations, olive in color, were visible; they did not take on stain. All the inclosed bodies, with rare exceptions, had a distinct capsule with double contour.

It was rare that two completely similar bodies were found in the preparations. They all differed in their dimensions and in their varied structure. The simplest body had the aspect of olive rounded masses of colloidal consistence more and more complicated.

(To be continued.)

New Methods in Skin-Grafting.— A Russian physician, P. Modlinsky, has succeeded in filling up large spaces from which diseased bones have been removed, by allowing the cavity to fill with blood clot, and then, after the clot has begun to organize, grafting upon it pieces of skin of considerable size. He reports good success.

An American physician has succeeded in restoring hair to a bald place on a man's scalp, by grafting portions of hair-bearing skin from the scalp of a healthy man. The grafts were made by means of a punch, and involved the whole thickness of the skin. Recent experiments seem to show that it is not necessary, as has formerly been supposed, that skin-grafts should be exceedingly small, only that they should consist of the more superficial layers.

Vesication for Incontinence of Urine.— Harkin has suggested the application of a vesicating agent in the region of the neck, as the best method of treating incontinence of urine. This is favorably reported by English physicians who have employed it, it being claimed that a cure was always found, even in most inveterate cases which had resisted all other methods of treatment.

A New Method of Treatment of Spina-Bifida. — M. Berger recently reported to the French Academy of Medicine a case of spina-bifida involving the lumbar region of the spinal cord, in which he had effected a cure of this defect in development, by opening the sac and filling the deficiency in the osseous structure of the vertebræ with a portion of bone cut from the omoplate of a young rabbit. The cure was absolutely complete at the end of four weeks, the union of the bone inserted with the vertebræ being perfect. A paraplegia which existed before the operation was not relieved.

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

Some Modes of the Transmission of the Bacillus of Tuberculosis. — Prof. Samuel G. Dixon, who has made a number of experiments on the subject of tuberculosis, to the end of bringing about a better sanitary condition in the country, has demonstrated that in walking along the streets, or in buildings, such as railway stations, public halls, etc., the women's dresses that touch the ground, raising more or less dust, and gathering a considerable amount of dirt, also accumulate dangerous germs. He states that from one of these dresses dragged over the streets a few times, he was able to demonstrate the presence of seven bacilli of tuberculosis on an inch glass slide on which a little of the dirt from a dress had been dusted. He draws attention to the fact that these dresses thus contaminated, are afterward brushed or dusted off in the homes, in the ladies' drawing-rooms, etc., most of which are, perhaps, more or less poorly ventilated. It is easy to realize how a sufficient number of the bacilli of tuberculosis, and even spores, may thus be liberated in the air and then inhaled into the lungs.

The Bacteria of Melons. — Dr. Byron Halstead in the *Botanical Gazette*, Nov. 11, 1891, describes a disease of melons and cucumbers on specimens from Bangor, Maine, and the central parts of New Jersey. To prove that the diseased plants were suffering from the result of the life of micro-organisms, numerous inoculations were made with the bacteria found in the diseased parts. The result was conclusive. The inoculated parts soon rotted and became affected in the manner in which the original disease presented itself. Experiments were conducted also with seeds. Two lots, consisting of sixteen seeds, had been planted in two different pots, both of which were placed in the same conditions and surroundings. One of the pots was watered with water containing these bacteria, and only two germinations resulted, both of which died shortly, while in the other pot watered with pure water, the germinations produced good plants.

A New Diplo-Bacteria found in the Blood and Urine of La Grippe Patients. — MM. Teissier, G. Roux and Pittion, made a report at the Academy of Sciences, Paris, very recently, concerning a new pathogenous diplo-bacteria found in the blood and urine of persons suffering from *la grippe*. They had noticed such an organism as far back as May, 1891, and had seen then that an intra-venous injection of them into the rabbit always produced a disease having some analogy with human *la grippe*. Since then they have made a number of experiments, and have obtained some important results. Cultures made from blood of patients, placed in beef broth at 37° C. appear fertile at the expiration of from thirty-six to forty hours, and contain elements in groups and fine chains, short and immobile, resembling streptococci. Until October last, these gentlemen had failed to find anything beside these elements, but since then, they have seen them associated with isolated organisms in the form of diplo-bacilli, occasionally visible on a fresh preparation, and absolutely like those which they had extracted from urine the day that (the blood ceasing to be fertile) the urine primitively sterile, became fertile. They are not yet ready to affirm that the presence of these elements are not mere associations of microbes. The investigators give a number of experiments on rabbits which lend color to the theory that acute poisoning was produced by the injection of products manufactured by those germs.

Bacteria in Peritoneal Serum of Strangulated Hernia. — Some investigations have been made as far back as 1883, by M. Nepveu, and later, in 1886, by M. Gané, concerning the cause of the peritoneal infection in hernia, and bacteria had been observed by them in the exudation; but not until M. Bonneken (Virchow's Archiv. Vol. CXX. p. 7), had any experiments been made for the purpose of studying the bacteria in their action. M. Bonneken experimented on dogs, in which he purposely produced strangulated hernia. The germs found in the exudation in all the stages of strangulation, he was able to identify with those contained in the intestine. The species of germs that he encountered most commonly, are thirteen in number, among which we may mention the *streptococcus*

coli, brevi, and gracilis. The bacterium *lactis* (aerogenes), and the bacterium *coli communis.* The author has not clearly determined how the passage of the germs from the intestines takes place, but it seems probable that it is through the lymphatic vessels.

The Resistance of Virus of Pneumonia in Sputum. — Dr. Bordoni-Uffreduzzi (*Centralblatt für Bakteriologie, X, p. 305*) reports his experiments on the resistance of the germ of pneumonia to the action of the atmospheric air and light in buildings. He placed small particles of sputum on pieces of linen and allowed them to dry in a room, either in diffused light or exposed to sunlight, during the months of May and June. At various intervals he inoculated rabbits with the virus triturated in sterilized water. In the first series of experiments (diffused light), rabbits inoculated after 2, 5, 7, 8, and 19 days, died of characteristic septicæmia due to the pneumonia diplococcus of Fraenkel. Another series of rabbits inoculated 5, 10, 15, 25, 30, 35, 40, 50, 55 days after dessication, died from the effects of the germs. Those inoculated after 60, 65, and 70 days, lived. In the the third series (sunlight), animals inoculated with dessicated matters, after 1, 2, 6, 9, and 12 hours, died. The last, however, lived until the eighth day, which indicates the attenuation of the virus.

The Action of Muscular Tissue in Certain Infections. — It is a well-known fact that muscular tissue contains comparatively few microscopical organisms in most infections. In tuberculosis, for example, few experimentalists have been able to discover the bacillus in the muscles. M. Arloing mentions that in forty-two series of practical experiments with flesh-juice from forty-five tuberculous animals, seven only were followed with tuberculization.

These facts have led M. Tria to institute researches with a view of explaining the cause of this condition. In a report published in *Giornale Internazionale delle Scienze Mediche,* XIII, p. 361, he demonstrates the following facts about muscular juice: That the bactericide properties of blood serum and muscular juice are the same. The juice of dog meat is slightly more active than that from the flesh of the rabbit or of the horse. The microbic destruction is in proportion to the quantity of bacteria inoculated; that is to say, it is more or less complete according as the micro-organisms introduced were greater in number or smaller. It is also found that the slight acid reaction of the muscular tissue seems to have no effect in producing this result, because the same was obtained after neutralization.

The Action of Essential Oil Vapors on the Bacilli of Typhus, of Tuberculosis, and of Charbon. — The bactericide action of the essential oils has been well established by a number of experimentalists. Recently, however, M. Omeltschenko (*Centralblatt für Bakteriologie, IX., p. 815*) has made experiments which not only confirm the views held previously, but establish also the quantity of vapors necessary per liter of air. He arrived at this fact by using specially contrived culture flasks, and passing through them air impregnated with the vapors to be studied. Among the results obtained he gives the following: The bacillus of typhus is killed by air saturated with essence of cinnamon or essence of valerian, in 45 minutes; 0 gr. .0005 of the first essence per liter of air was necessary, while 0.0082 was necessary of the second. The bacillus of tuberculosis is killed by the vapors of cinnamon in 23 hours, the air containing 0 gr. .018 per liter. It is killed by essence of lavender in 12 hours, 0 gr. .0078 per liter, being the amount necessary. The essence of eucalyptus destroys this germ also in 12 hours, but the degree of saturation must be 0 gr. .0252 per liter. Among his conclusions we find that the vapors of essences contain a considerable degree of activity as disinfectants when the air saturated with it is constantly renewed. When the degree of saturation diminishes, the vapors destroy the germs at the beginning, but after that they only prevent their growth. Regarding their germicidal properties, he classifies the essences according to their strength, as follows: The essence of cinnamon, the essence of fennel, essence of lavender, essence of cloves, essence of thymus, essence of mint, essence of annis, essence of eucalyptus, essence of terebinth, es sence of lemon, essence of rose. The two last-named, lemon and rose, are very slight disinfectants.

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THE AMERICAN MEDICAL TEMPERANCE ASSOCIATION.

THIS Association, founded by Prof. N. S. Davis, M. D., of Chicago, who has long enjoyed the respect and confidence of the entire medical profession, and is familiarly known as the father of the American Medical Association, will hold its second annual meeting in connection with the meeting of the American Medical Association at Detroit, June 9. The exact place and hour have not yet been determined but will be announced later. The object of this association is thus stated in the "Plan of Organization and By-Laws:"—

"The objects of the Association are to advance the practice of Total Abstinence in and through the medical profession, and to promote investigation as to the action of alcohol in health and disease, and it aims at being a bond of union among medical abstainers scattered all over our country. It admits as members regular medical practitioners who are practical abstainers from all alcoholic liquors as beverages.

"Members are not required to sign any pledge, but if such, for any reason, cease to be total abstainers, it is expected that notice of withdrawal from the Association will forthwith be sent to the Secretary. The liberty of members in prescribing alcohol as a medicine is entirely uncontrolled."

This effort to organize the members of the medical profession who are themselves abstainers from the use of alcoholic liquors as beverages, and interested in the promotion of temperance principles, is certainly a most laudable one. Dr. N. S. Davis was one of the pioneers in investigations respecting the physiological effects of alcohol. Nearly fifty years ago Dr. Davis published the results of most interesting experiments which showed the inutility of alcohol as a food substance, and its deleterious effects upon the human body. These experiments were probably the first which clearly demonstrated the fact that alcohol lowers the bodily temperature and thus involves a waste of energy. Richardson and other experimenters took up this line of investigation and corroborated the results of the early experiments of Dr. Davis. It is certainly very opportune that a pioneer in this line of investigation should be the founder of the American Medical Temperance Association. A similar association has existed in England for many years, and great good has resulted from its propagation of temperance principles.

At a meeting of the State Medical Society, Dr. Davis read an able paper in which he expressed very clearly and emphatically his position as regards the use of alcohol as a beverage and his belief in its inutility as a remedy. Dr. Davis would have alcohol discarded not only from the sideboard but from the dispensing case as well.

While the writer has never taken the position that alcohol should never be used under any circumstances as a remedy, he has, in a practice of nearly twenty years, found few occasions for its use, and is more and more convinced that while certain therapeutic effects can be evidently obtained by this drug, there are other drugs by which the same results can be equally well accomplished, so that it may be eliminated from the list of

therapeutic agents, if not without some inconvenience, certainly without any material loss. J. H. K.

VARIOUS MICROBES IN TUBERCULOSIS.

THERE seems to be a surfeit of preaching on the subject of tuberculosis; in fact, we scarcely find a medical journal which does not present something new or old on the subject every month. There is good reason for this continual discussion of the problem, for it is the most unfortunate, most widely disseminated, and perhaps one of the most misunderstood maladies to which mankind is subject. In some States, as high as one fifth of the death-rate is due to tuberculosis, while in very few States is it lower than one fifteenth of the total mortality per year. In many quarters, physicians may be classed as fatalists, so far as this malady is concerned, for they look upon it as incurable, and direct their efforts to nothing more than a palliation of the most distressing symptoms, such as the alleviation of the cough, night-sweats, etc. Indeed, they actually give it as their opinion that consumption, so-called, is always fatal, and nothing can be done to permanently benefit the afflicted. As an English writer has well said, "There is no more unfortunate belief extant in the medical profession."

It is true that the great majority of tuberculous persons die, but this does not warrant physicians in folding their arms and contenting themselves with merely offering a few formal words of sympathy. For every disease there is doubtless a remedy; and if the specific remedy against consumption has not been found, it is not for us to say that it will not be discovered some day. Perhaps there is no such thing as a specific agent to absolutely counteract any given disease, but we have very good grounds for believing that against every ailment of the human body, there exists somewhere in nature an antidote more or less capable of counteracting the destructive tendency.

Consumption is one of the most complicated maladies to which man is susceptible. Besides the bacillus of tuberculosis, which is doubtless the primordial living factor in producing alterations whenever found, there are numerous other organisms, in certain organs at least, which may and do complicate to a very serious degree the nature of tuberculosis. In fact it is doubtful if the germs of tuberculosis alone could always, in every susceptible organism, produce such deadly transformations if they were not aided by other agents appearing in the field before or after the appearance of the first lesions. Perhaps every human being at some time or other has inhaled some of the true germs of consumption, and yet comparatively few succumb to the malady. This indicates a natural resistance on the part of the animal organism, and also that the germ must find a proper soil for development; it cannot grow well without a fertile medium for nourishment. There are many cases of pulmonary consumption, so-called, in which, for years, there may be hacking, spitting, and coughing with a discharge of considerable muco-pus and innumerable germs of various kinds, and no bacilli of tuberculosis can be found; but if watched closely, at some period or other, this microbe also may be found, and then the disease will progress rapidly, and death result in a short time. Is there not reason to suppose that in these cases other germs than those of tuberculosis were the agents that prepared the field for the latter to grow? Do we not sometimes find chronic cases of what we term bronchitis, lung-troubles with cavities even, in which no germ of tuberculosis can be found, although numerous other germs are present? It would seem that these first lesions are not due to the bacilli of tuberculosis. This view is supported by the fact that in

some post-mortem investigations in which the bacilli had not been found during life serious lung-lesions are sometimes present without a single one of these germs.

In the judgment of the writer (basing his opinion on several years' experience in analyses by means of microscopic investigations as well as in observations of patients) there are many cases that are diagnosed as true pulmonary tuberculosis which are not due to the bacilli of tuberculosis, but are chronic lesions following some acute or sub-acute lung-disease, in which other microbes than those of the bacilli of tuberculosis produce the alterations. The pus and a number of other products in the lungs, often result from the growth of organisms entirely different from the bacilli of tuberculosis. In such cases it is not uncommon to find the latter germs appearing at some state or other of the disease, hastening the malady to a fatal termination. The termination might have been different had this organism not been introduced. Indeed, persons suffering from chronic lung lesions sometimes live to an old age, and at no period can the germ of tuberculosis be found; but death will result more surely and more quickly if this germ appears after the lungs have already undergone a considerable transformation. On the other hand, there is no doubt but that there are many cases of pulmonary phthisis which begin at the very outset with the growth of the bacillus of tuberculosis. Possibly the lungs are always in some way or other prepared for their reception and future growth, but it may not be by the action of other germs; it may be by such causes as a cold, during which mucus is exuded from the bronchial tubes, in which the inhaled bacilli may adhere and begin to generate. But after the lungs have been weakened by these, affected here and there by various colonies, the other very numerous microbes of pus, decomposition, etc., arrive and act as secondary causes of disease and complicate the primordial malady to a very serious degree.

So, in practice, while it is essential to remember that the bacillus of tuberculosis is the essential cause of *true tuberculosis*, we should consider that there are doubtless many causes of so-called consumption in which the lesions are not due to the bacillus of tuberculosis,—primordially at least, and sometimes they never appear during any part of the malady. In other words, there are two kinds of phthisis, the one in which the bacillus of tuberculosis is the essential and primordial factor, and complications by other germs may or may not occur later to any serious degree; the other, in which the lesions are due to various microbes acting subsequently to some weakening agency not related to the bacillus of tuberculosis. The first is always identical, and may be readily produced by inoculation; the latter produces different lesions, and is not inoculable in the sense that we may thereby reproduce any given set of lesions.

This view of the question is supported by the theory of the contagiousness of tuberculosis. That true tuberculosis is transmissible by inoculation, many investigators have established. It is possible, even, to produce it by inoculating the pure germs directly into the *sound* animal. On the other hand, false tuberculosis, or so-called pulmonary consumption in which no tuberculous germs are found, may be called infectious, inasmuch as germs are factors in the case, but is not essentially contagious, as the germs which produce the transformations are common germs of pus, etc., which may be inoculated anywhere in the body, producing local lesions which eventually disappear entirely, or cause septic infection of a common character, which may cause death. The first parasite, I repeat, is one which produces a disease which, in its nature, lesions, and termination, is always identical, even when inoculated in

a state of purity, while the latter parasites may or may not act independently; they produce various disorders, and act as in a wound, as much or more perhaps by their association than by their isolation. This form is not so fatal.

It is necessary, then, in the practice of medicine, to take these facts into account, and not jump at the conclusion that every case of suspected consumption is truly fatal tuberculosis. Very careful microscopical analysis should be made in each case, and the strictest possible inquiry of the subjects, both from an historical and from a physical point of view should take place.

There is great hope for a patient suffering from lung lesions in which the bacilli of tuberculosis are not to be found, even though these lesions may be apparently severe; and there is hope, even, for true tuberculous patients, if their case is diagnosed early. The climatology of various countries has been so well studied, the various physiological and medicinal means of treatment so much advanced, that even truly tuberculous individuals may be cured, or at least the disease may be so arrested that they may live for years. P. P.

MICRO-PHOTOGRAPHY.

In these days of microscopical research in all the branches of medical science, the use of photography for the demonstration of the revelations of the microscope would seem a very desirable thing indeed. At first thought, it would seem that if one could obtain good photographs of every section of physiological and pathological tissue as well as of the micro-organisms found in connection therewith, a good deal more satisfaction would be obtained than by any other mode of illustration, and science would advance more rapidly. A few authors seem to have been impressed with this idea, and now we have books published in which micro-photographs play an important part in the illustrations. So far as bacteriology is concerned, the results are usually very satisfactory, but as to the micro-photographs of sections, in order to demonstrate the nature of the tissues entering therein, and to give an idea of the cellular arrangement, micro-photography is not a success. Its utility is only relative. It is reduced to the role of an auxiliary. It cannot reproduce with faithfulness the various superposed elements of a section, no matter how thin it may be. With the very best of section, with the finest of mount, the microscopist, in order to study the tissues well, must vary the micrometric screw up and down in order to penetrate the substance totally and study each plane satisfactorily. The superposed planes of a section cannot be reproduced by photography; all that can be reproduced at one time in one picture, is the plane that is in the proper focus, and even this sometimes is not entirely satisfactory, for certain colors in one section will give a more definite and positive picture than others.

Elective stains make beautiful mounts of various shades, but photography fails thereby to reproduce the arrangement faithfully. As a result, photographs of sections of tissue, are not satisfactory to the student; they do not present to the eye the idea that is gathered concerning the structure of a given tissue in reading a text-book, nor do they present the appearances that one finds through a microscope in moving the micrometric screw while studying a specimen. The draughtsman, on the other hand, can draw a section, and superpose the planes which he observes at successive points of focus in using the microscope. It is not without misgivings, therefore, that we see the tendency in certain quarters, to substitute micro-photographs for drawings in histology and pathology. Though we would not discourage the use of pho-

tography in this line, we insist that drawing is still by far the most reliable method of reproduction of microscopical appearances, in normal and morbid histology. It is true that one may exaggerate in drawing, and draw too much on his imagination, and thus somewhat mislead the student, but the arrangement of the various planes of the sections which are drawn, even if not absolutely correct, is far superior to the very best photograph of one plane of any given section.

P. P.

REACTION IN COLD BATHING.

THE benefit derived from cold bathing is not due to the abstraction of heat, but rather to the stimulation of the nerve-centers through the action of cold upon the peripheral nerves, from which results the so-called reaction following the application. In many cases, however, especially neurasthenics, dyspeptics, and anæmic patients, a good reaction does not occur, and consequently the beneficial result desired is not obtained. The class of patients referred to, usually dread cold water, and if they can be induced to employ baths at all except for purposes of cleanliness, insist upon a temperature so high that the effect is relaxing rather than tonic.

For many years it has been the writer's custom to employ, in such cases, a warm bath just preceding the cold application. Persons who have a most inveterate dread of cold water, may be, in a short time, educated not only to tolerate but to enjoy applications of a temperature even 40° or 50° below that of the body. A convenient method is to administer a full bath with a temperature of 100° to 105° for a few minutes before the application of the cold spray, douche, shower, rubbing, wet sheet, pack, or plunge, as the case may be. The higher the temperature of the warm bath, the lower may be made the temperature of the succeeding cold bath, and the more vigorous will be the reaction produced. It is important, however, to continue the cold application a sufficient length of time to produce a strongly tonic condition of the blood-vessels of the skin, otherwise the patient will perspire so freely as to require a second cold application, which is not likely to be followed by so good a reaction as the first.

J. H. K.

The Effect of Warm Baths upon Assimilation.— The beneficial effects of baths upon assimilation has been recognized empirically from the most ancient times. It is only very recently, however, that this subject has been made a matter of experimental inquiry with the employment of the exact methods of the physiological laboratory, so as to place this class of therapeutic agents upon a thoroughly scientific basis.

Winternitz, of Vienna, has done much most excellent work in the determination of the physiological effects of baths employed in various ways. Within the last year or two, some very interesting observations have been made by a number of Russian and other experimenters.

Faddeeff found that the Russian bath produced in a healthy person an increased assimilation and disintegration of protes, which is doubtless due to the stimulating effect of the elevating temperature of the bath.

Grusdew found that the Russian bath increased the assimilation of the minerals, especially lime and iron.

Zawadski found that daily tepid baths, 95° F., produced an increased assimilation and dissimilation of protes, and an increase in bodily weight.

Karvkoff showed that the assimilation of fats is notably increased by warm baths.

In view of such facts as these, it is surprising that this important therapeutic agency should be so much neglected. The probable cause is a lack of a knowledge of the exact conditions under which

baths of varying temperatures should be employed, and especially the most universal lack of convenient means for the use of this remedy. It is true that the warm bath may be taken at home, but its value is greatly lessened when the advantages of a skilled bath attendant cannot be had in connection with it. J. H. K.

Natural Resistance to Infectious Diseases.—It has been known, in a general way, that the weakening of the organism tends to lower its natural resistance to infectious diseases. All causes, in fact, which diminish the natural forces, and in any way interfere with the full, strong, natural, physiological actions of the economy, favor the receptivity of micro-organisms and modify the natural power existing in individuals to resist infection. A great number of experiments and observations have been made to determine the susceptibility to infection of animals under various conditions, such as under fatigue, hunger, etc. Experiments concerning the influence of abstinence in lowering natural resistance to infections have been made recently by MM. Canalis and Morpurgo. They used the bacillus of anthrax in their operations, and demonstrated that in the majority of cases the organism is very much more susceptible to disease when it is in want of food, than when nourishment has been satisfactory. In several series of experiments, the results pointed to the same conclusion, except in some instances of the inoculation of white rats.

It is important to note that in the treatment of general infectious diseases, food ought to play a most important part, and that it ought to be as natural, as easy of digestion, and as simple as possible, thus not overloading the stomach, and yet giving the body proper and ample nourishment to sustain the natural forces, realizing thereby the conditions most favorable for rejecting contagion and infection.

P. P.

REVIEWS.

Manuel Populaire des Premiers Soins a Donner aux Maladies et aux Blesses Avant L' Arrivee du Mededin.—This popular manual of the first care for the sick and wounded before the arrival of a physician has been prepared with great care by a commission appointed by the Society of Hygiene, prominent among whom we note the eminent Dr. Pietra Santa, the Secretary of the Society. Among the leading chapters are, "General Care in case of Accident," "Contusions, Sprains, and Dislocations," "Wounds," "Foreign Bodies in the Ear," "Foreign Bodies in the Eye," "Foreign Bodies in the Nasal Cavity, the Stomach, Respiratory Passages, etc.," "Hernia," "Hemorrhages," "Fractures," "Burns," "Insolation," "Freezing," "Drowning," "Hanging," "Asphyxia," "Fall with Loss of Consciousness," "Apoplexy," "Epilepsy," "Poisoning," and "Death." We have perused the work with much pleasure, and would like to see it translated into English.

Bacteriological Diagnosis.—By James Eisenberg, Ph. D., M. D. Translated by Norval H. Pierce, M. D.; F. A. Davis, Publisher, Philadelphia. Price, $1.50. This translation is not as good as the original, if we are to credit the approval of the latter by German writers. The work, as a whole, presents some very useful points, and is a handy guide book, but it presents, unfortunately, some serious errors that may work harm if we depend upon it for diagnoses. From a bacteriologist's standpoint we hope that a future edition will soon appear, from which these mistakes will be eliminated.

The Hygiene of Consumption.—By W. John Harris, M. D., I. H. Brown & Co., Publishers, St. Louis, Mo. This little book contains most important instructions on the subject of consumption. It is written in plain language, suitable

for all classes of readers. It will do good. But we regret to see in its pages an evident attempt to discredit the advances of science concerning the action of the germ of consumption, the bacillus tuberculosis. In his chapter on the germ theory the author says, "It may be safely said that this specific germ (meaning the bacillus of tuberculosis) does not exist in the sputa until the disease is well advanced." The reviewer has analyzed sputa for the diagnosis of consumption for seven or eight years, and has many times encountered "this specific germ" almost at the very outset of tuberculosis, — months earlier than the diagnosis could possibly be made by any other means.

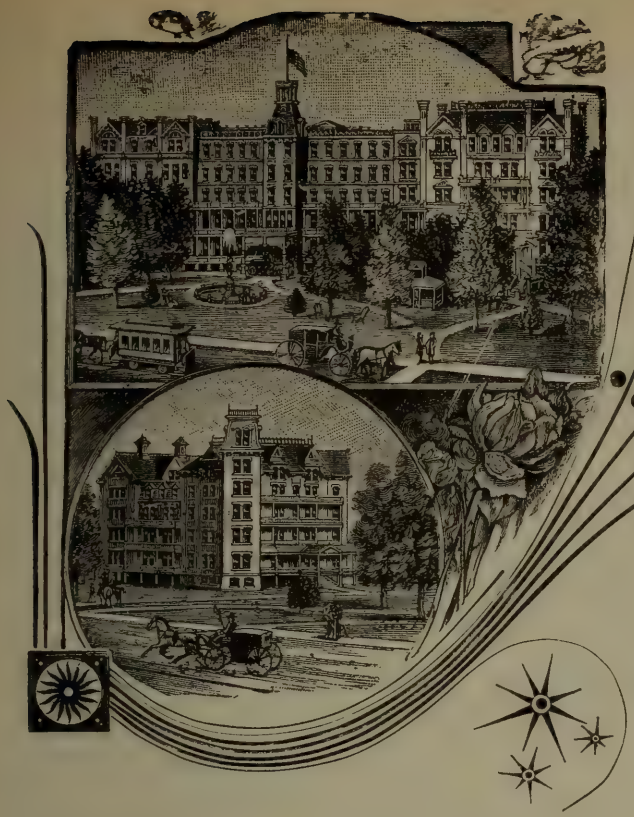
The author lays much stress on the point that there must be a field for the germ of consumption to grow, and that this field can be prepared by wasting disease, exhaustion, overwork, etc. This is very true and proper. Yet it should be remembered that in our methods of living, at least fifty per cent of the people *always* present the conditions enumerated, and are therefore always more or less prepared to develop this germ wherever it may be "waiting to find lodgment." It is not true that the bacilli of tuberculosis are found only "after suppuration has begun." A fresh tubercle at its incipiency, presents no evidence of suppuration as meant by the author, and yet it contains the bacilli. Suppuration in consumption is not the exclusive result of this particular germ, but is the fermentation, if I may so speak, of tissue previously affected. This suppuration is the result of many kinds of microbes, most of which are inoculable under certain conditions.

The inoculability of tuberculosis has been again and again positively proven by inoculation by inhalation in animals in the very best of conditions, physiologically speaking. The writer himself has repeatedly produced such cases, and the bacilli were present from the very beginning.

The researches of the past twenty years, the experience of medical scientists, and the great majority of practitioners do not warrant the conclusion that the bacillus of tuberculosis is not to be feared. Dr. Harris firstly points out the various conditions preparing the field for the germs to grow, but he should lay equal stress on the fact that this plant will grow if the germ is not present. This question is so important for all mankind that arguments in favor of any exclusive theory, as well as the following of any special view in our attempts to cure and prevent the disease, are out of place. Justice, humanity, science, demand that we direct our batteries at every possible point of invasion. The germ is a formidable factor; indeed, without it there is no *true tuberculosis*, though there may be many cases of so-called consumption. We must, therefore, if we are true physicians, take this into account.

Epitomes of Three Sciences.— By H. Oldenberg, J. Jastrow, C. H. Cornill. The Open Court Publishing Co., 169 La Salle St., Chicago, Ill. This is a most instructive little volume, giving an account of the work done in three different fields of modern knowledge; viz., Comparative Philology, Experimental Psychology, Old Testament History. These three subjects have a most important bearing on the religious thought and views of our time. The little book is what many will hail with pleasure. Price, 75 cts.

Homilies of Science.— By Dr. Paul Carus, Open Court Publishing Co. Instructive essays by a profound philosopher. They are eight in number: Religion and Religious Growth; Progress and Religious Life; God and World; The Soul and the Laws of Soul Life; Death and Immortality; Free Thought, Doubt and Faith; Ethics and Practical Life; Society and Politics. Price, $1.50.



WHERE TO SPEND THE SUMMER

AT this Season of the Year, thousands of Invalids are seriously considering the question, —

Where Can I Spend the Months of July and August, and part of September, with the Greatest Profit and Satisfaction?

THE ANSWER

to this question depends on what the individual wishes to accomplish by a summer vacation. If change and recreation only are desired, these can be found in a thousand places — at health and other resorts which abound in almost every State in the Union, none of which, however, excel the delightful resorts of northern Michigan.

If, in addition to rest and recuperation, the invalid needs a careful study of his diseased conditions, and an intelligent regulation of diet, exercise, and all other health conditions, — in other words, scientific health culture, efficiently carried out by the aid of the best known medical means and appliances, thoroughly trained nurses and attendants, and competent physicians, —then the choice between the most desirable places becomes very much restricted. There are certainly few institutions in this country where the needs and desires of an earnest health-seeking invalid can

be satisfactorily met. Such places can be counted on the fingers of one hand, and are, perhaps, little known because of the fact that the managers of such institutions are conducting them in a scientific, and in some instances a philanthropic spirit, and consequently do not employ as a means of winning patronage, the emblazoned advertisements, the truth-sacrificing circulars, and other advertising methods commonly resorted to by the proprietors of mineral springs establishments, bogus sanitariums, and other so-called "health institutions" and quasi-medical establishments, with which the country abounds.

The advertisements of these establishments do not appear in public prints or popular magazines because such advertising is closely akin to quackery, and brings those who employ it into bad company.

The managers of the Sanitarium at Battle Creek, Michigan, many years ago undertook to organize a thoroughly scientific institution which would represent rational medicine in its most advanced form, and would be exactly what it professed to be — an institution where patients are honestly and fairly dealt with, treated at reasonable rates, given kind attention and comfort, and opportunity for the recovery of health under the most favorable conditions. The majority of patients treated in this institution are sent to it by physicians who by personal acquaintance, or through the reports of their patients, have become thoroughly familiar with the character of the institution and its management.

BRIEF DESCRIPTION OF THE SANITARIUM.

BATTLE CREEK, one of the most beautiful and prosperous cities of Michigan, is centrally located in the salubrious Peninsular State. Its population is 20,000, while its death rate is but seven per thousand. Battle Creek is situated on two great thoroughfares of railway travel between the East and the West, being at the junction of the Grand Trunk and the Michigan Central lines; and two other railways make it easy of access from the South.

The city has an electric railway and is lighted by electric lights. A great number of pleasant drives are afforded by its well-kept and shaded streets.

The Buildings are lighted by a 700-light plant, Edison incandescent system.

Safety Hydraulic Elevators. Outside stairways for fire escapes accessible from every window.

The Institution affords facilities for baths of every description: Turkish, Russian, vapor, electric, water baths of all kinds, and the electric light bath. Independent accommodations for ladies and gentlemen, sufficient for 80 persons at one time. More than 800 feet of glass for sun-baths.

A General Parlor, 40 x 50 feet, is luxuriously furnished with Dhagistan rugs, easy chairs, etc. The Dining-Room has a seating capacity of 400, is beautifully lighted and ventilated, and always cheerful. No kitchen smells. Cuisine unsurpassed; table service excellent. Everything an invalid needs, and special dietaries prepared as directed.



VIEW OF GOGUAC LAKE FROM SANITARIUM LAKESIDE GROUNDS.

The Gymnasium, 85 x 45 feet, is supplied with every appliance for exercise, and furnishes special instruction and class drills in Delsarte and Swedish gymnastics, under a trained director. Exercise by prescription.

The Swedish Movement Department, both manual and mechanical, is the most extensive in the United States. Vibrating bars and seats, kneaders, rubbers, beaters, shakers, and manipulating appliances of all sorts.

The Electrical Department contains every improved appliance for medical applications of electricity, Galvanic, Faradic, Dynamic, and Static electrical apparatus and appliances for electrolysis, electro-cautery, etc.

An Aseptic Maternity on the cottage plan (steam heat and thorough ventilation), provides the best possible conditions for lying-in patients, with experienced professional attendance and rigorous aseptic management.

Special Departments for surgical cases, eye, ear, throat, and lung diseases, nervous diseases, genito-urinary diseases of men (non-specific), opium and alcohol habits, and diseases of women. A kindergarten and nursery, to keep the children happy and out of mischief.



SUMMER HOUSE AND FRESH-AIR INLET.

Three Fine Greenhouses, maintaining a magnificent collection of palms and various tropical flowers and plants, keep the house filled with bloom during the winter season. Flowers are everywhere indoors during the winter season. Patients can visit the greenhouse at any time without going out of doors.

Glass-Inclosed Sun-Parlors and Verandas for winter sunning and promenading.

Pure Water from sandstone rock.

There are from 250 to 300 Employes in the Sanitarium service the year round, of whom from 90 to 100 are medical attendants and nurses. Also seven thoroughly trained physicians, and a large corps of manipulators skilled in massage and the Ling system of Swedish movements.

The Sanitarium Training-School, in which our nurses are trained, is the largest and most popular in the United States. Its course of training is the most complete and thorough of any school.

Tri-Weekly Lectures on popular medical subjects by the physicians.

Abundant Means for Recreation indoors during inclement weather. Facilities for walking, driving, and horseback riding at all seasons.



ON THE LAWN.

The Sanitarium is Not a Pleasure Resort nor a fashionable hotel, but an ideal place for invalids needing good nursing, the benefits of regular habits and scientific professional care and treatment, and who desire to get permanently well.

The Sanitarium Nursery and Kindergarten. This enables mothers to bring little ones with them without being burdened with their care and supervision. The children have the advantages of kind and experienced teachers and ample playgrounds.

For Further Particulars, see large circular and card of rates.

J. H. KELLOGG, M. D., SUPT.,

Sanitarium, BATTLE CREEK, MICH.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., MAY, 1892.

THE ROLE OF MICRO-ORGANISMS IN THE PRODUCTION OF GAS IN THE ALIMENTARY CANAL.

THE formation of gaseous matters in the alimentary canal is a very common thing in health and in disease. Though usually considered as a mere unpleasantness in health, it often constitutes really a more serious condition, particularly when the production takes place in the stomach, as in cases of sudden and acute indigestion. In disease it is always of a grave character and often is a most aggravating complication. The Director of this Laboratory[1] has made researches on this question, lasting many months, and from the results obtained (though the work is unfinished) feels justified in formulating some opinions.

Gas Formation in Healthy Individuals. —In the first place, we should remember the physiological condition of the stomach. In health, this organ secretes acid gastric juice, the quantity of hydrochloric acid in it being considerable. Food can be properly digested by this juice only when the acid named is right in quantity and the gastric secretion as a whole is normal. In other words, proper digestion in the stomach depends on normal work done by it and normal secretion into its cavity, provided always that, on the other hand, the food digested be not abnormal in quantity and quality, and that it be not swallowed too rapidly. I need not remind the reader here that the digestion of only abuminoids can take place in contact with gastric juice.

On this basis, we can formulate by way of repetition the following proposition:—

First, That satisfactory digestion of food can take place only when the gastric secretion is normal in every respect.

Second, That the food must be of proper quality and quantity.

Third, That it must not be too rapidly ingested.

Now all these conditions on which proper digestion depends, could only end in more or less complete failure of this act if some other factors did not enter to complicate matters. The portions of food that failed of digestion would inconvenience the system perhaps, but would pass on and be expelled from the economy with the feces. What is it that complicates matters so as to make indigestion, no matter how trifling in appearance, a very serious question? It is the transformation of some of the food into various products. The digested food is appropriated by the economy and utilized to feed the tissues, but the undigested food is decomposed, and serves to form different substances among which are the different kinds of gas.

We could here with propriety go into the consideration of the different products of the decomposition of food in the alimentary tract, and point to numerous poisonous substances which are generated to the great damage of the organism. These cause headache, melancholia, dreams, irritation in the kidneys, etc., and very likely produce also alterations of such serious nature in the nervous tissues, as to play a most important part in the causation of various forms of insanity. But I wish to consider this time only the production of gas. It has been suggested that bacteria are the agents which produce it in the digestive organs, and some physicians insist on this assumption without regard to the locality in which fermentation occurs.

For those who know something of the life of bacteria, it will be readily observed that this opinion is too broad and sweeping. In fact, the normal gastric juice contains too much acid to allow the growth of bacteria. Not only that, but it actually destroys them in a very few minutes. So, a great modification of this fluid must take place before bacteria proper can grow in the stomach sufficiently to produce gas in inconvenient quantity. It must

[1] Paul Paquin, M. D., Sanitarium Laboratory, Battle Creek, Mich.

be impaired by disease or largely diluted with great quantities of fluids, or the microbes must be protected against the acid in great masses of food stuffs. This idea is largely theoretical, but is a logical deduction from the fact that the hydrochloric acid of the stomach is a bactericide. Indeed, if we consider, furthermore, that bacteria do not as a rule develop at all in acid substances, for the very reason of the acidity itself, we can theoretically go further and say that, in the stomach, unless the gastric juice is so deficient as to be without hydrochloric acid —a condition scarcely compatible with life— bacteria are never the agents that produce bloating of the stomach.

The writer has made numerous experiments on the subject, and concludes that gas in the stomach is produced by fungi introduced with the food, and at other times under certain conditions, by purely chemical combinations of certain food elements and elements in the gastric juice. Every experiment and observation eliminates the microbes entirely from the phenomena, even in dyspeptics with greatly impaired gastric juice.

This view is supported by the fact that fungi are fermentative agents that may (contrary to microbes) grow in presence of acids. But even they are not liable to produce much fermentation in the stomach unless the gastric juice is deficient, or is very largely diluted, or masked, as it were, by excessive ingestions of easily fermentible substances, such as fruits and grains.

Meats are, doubtless, bad elements of food for those subject to gas on the stomach after meals, but my experiments pointed to vegetables as being incomparably more suitable for fermentation in this organ. This is supported by what is generally known concerning the nutrition of microbes and fungi respectively, the former living better on animal foods and the latter better at the expense of vegetables, from which they can produce enormous amounts of gas. It is only necessary to remember the immense quantity of gas that is produced by fruit, grain (and flour) fermentation to realize this. If one introduces at the same time gas-producing fungi into beef broth or a piece of meat sterilized, and into vegetable broth or flour or paste sterilized, it will be made apparent that while the production of gas is insignificant in the meat substances, it is very marked in the vegetable media.

Consequently, so far as the stomach itself is concerned, bacteria proper have little if any thing at all to do in the production of gas, and the media in which they develop best, *i. e.*, the animal substances, offer a poorer soil to the fungi that may grow in the stomach than do vegetables.

This is a question of great importance and significance in the treatment of certain forms of dyspepsia. I shall say nothing positive here on the very marked production of gas in the stomach of persons in which neither bacteria nor fungi can safely be claimed as active agents. In such cases, the gas begins to form sometimes instantaneously, while yet eating a meal, two facts which exclude the acts of living microorganisms as factors. I think that chemistry alone can explain this particular form of gas production.

Gas in the Lower Intestines.—If bacteria are practically harmless in the stomach, it is not so in the intestines, beyond the parts in which acidity may descend. Here, too, gas may be produced, but may be by the action of bacteria proper. Here all kinds of matters may form the basis of supply for its production. Any one who understands physiology will realize readily, however, that the gas of the stomach and that produced in the intestines vary materially, both in composition and in quantity. Besides this, gas in the stomach is usually a more serious thing in every respect than gas in the bowels; it is serious by reason of its very presence, and on account of the obvious disorders which it suggests in the structure and functions of this indispensable organ.

From the fact that gas, in the smaller bowels, is not a serious thing compared with its production before food reaches the duodenum; considering that it is a phenomenon of decomposition and transformation in a portion of the body obviously meant for this kind of work; considering that gas here cannot usually cause anything like the serious complications that may arise in the stomach, and that it does not suggest any serious organic disease, I will not consider it further. I wish only to point, partly by way of recapitulation, to some important indications of the foregoing researches.

First, fruits, grains, etc., under the action of fungi that may grow in the stomach, may produce gas in marked quantity; meats do not. *Second*, the condition of the stomach, or the quantity of food ingested must be abnormal before gas can be produced in any great quantity. *Third*, bacteria proper are not the agents that produce gas in the stomach, but they produce some in the bowels below. *Fourth*, there seem to exist conditions in which gas is produced independently of any foreign vegetation, and is likely the result of purely chemical action. This I submit as an hypothesis.

The practical suggestions of all this is that raw fruits, like apples, peaches, pears,—all of which have been tested by the writer,—should be peeled, or at least washed before eating, thus avoiding the ingestion of the numerous living ferment-producers always to be found in them. Fermented bread should be avoided, as the yeast plant, at least in the center of the mass, is not always destroyed by cooking, and may ferment again in proper temperature and medium. In other words, judgment should be used in excluding from the diet of those subject to bloating of the stomach, all substances that ferment easily. Besides this, it is well to remember that the mouth and various foods containing germs may serve as vehicles for the dissemination of fungi and other micro-organisms. The mouth should be washed before each meal; the more aseptic the food the better for those suffering in any degree from impaired digestion.

TECHNIQUE.

STAINING TUBERCLE BACILLI IN SECTIONS.

W. C. BORDEN, M. D., U. S. Army, in New Orleans *Medical and Surgical Journal*, says:—

"The method of staining the bacillus tuberculosis, which is hereinafter given, is not original with the writer, but on account of its certainty and comparative ease of working, it is thought worthy of record. It is the method now used in the Army Medical Museum at Washington, D. C., having been adopted by Dr. Wm. M. Gray, the microscopist of that institution, after exhaustive trials of other methods; first, on account of its certainty, and second, from its allowing of all the manipulation being made with the sections cemented to the slides, so avoiding the tedious and oftentimes damaging handling of the sections with section-lifters.

"Certainly a method which insures certainty of result, and provides for the handling of the sections cemented to the slides so that no part of them can be torn or lost, offers most obvious advantages—advantages which will at once be appreciated by workers conversant with modern methods of imbedding and sectioning.

"In practice, the tissue to be stained should be hardened, preferably in alcohol, in pieces not exceeding ¾ by ¾ by ⅜ inch in size, though tissues hardened by any of the regular methods can be stained. Alcohol is to be preferred, however, as after its use the bacilli stain more quickly and brilliantly than when one of the other hardening fluids, Müller's for instance, is employed. If it is desired to examine the tissue elements, it is well to harden pieces of the same tissue in Müller's fluid, and after sectioning, to stain the sections in suitable dyes for comparison with the sections hardened in alcohol and stained for bacilli. This would, of course, only be necessary when critical examination of cellular form was to be made, as the contrast stain employed in the bacilli staining process differentiates the tissue elements with all the distinctness necessary for locating the relation of the bacilli to the cells.

"After the tissue has been hardened, it is imbedded in *paraffine*, and sectioned in the usual manner. The sections are then cemented to the slides with a ½ per cent solution of gold label gelatine, made by dissolving 14½ grains of the gelatine in six ounces of warm water, then adding 30 grains of chloral hydrate as preservative, and filtering. Several drops of this are placed on a slide, a section laid on top, and the slide placed in a warming oven, kept at a temperature slightly *below* the melting point of the paraffine. In about five minutes all wrinkles will have been taken out of the section, which will lie perfectly flat and smooth on the surface of the gelatine solution. The slide is then removed from the oven and the surplus fluid poured from it, so bringing the section down into contact with its surface, after which it is set aside in a place protected from dust, to remain until the section is firmly cemented to it by the drying of the gelatine solution. The drying may be hastened by keeping the slides in an oven below the melting point of the paraffine, but it is best to set the slides aside until the next day, when the sections will be found to be perfectly cemented to them. The paraffine is then removed from the section by turpentine, the turpentine by absolute alcohol, the absolute alcohol by 50 per cent alcohol, and this by water, after which the slides are placed in a 5 per cent aqueous solution of potassium bichromate for five minutes. This renders the gelatine insoluble, and prevents the sections from leaving the slides during their necessarily more or less prolonged immersion in the fuchsin stain. The potassium bichromate is washed out with water, and the slides are then placed in a fuchsin stain, which is prepared as follows:—

"Fuchsin, 1.5 grammes; absolute alcohol, 14 c. c.; carbolic acid crystals, pure, 6 grammes; water, 100 c. c.

"Dissolve the fuchsin in the alcohol and the carbolic acid in the water. Mix the two solu-

tions and let stand for twelve hours, with occasional shaking or stirring, then filter.

"The slides are left in this solution a *sufficient* length of time. In tissues properly hardened in alcohol the tubercle bacilli stain very quickly, generally five minutes being sufficient to stain them deeply, but in tissues not especially prepared by proper hardening, a longer time will be necessary. For such tissues, or where absolute certainty of staining is desired, the sections should be left in the stain twenty-four hours. *Prolonged immersion* in the *fuchsin* stain does no harm and insures certainty of results. After a section has been in the stain a sufficient length of time, it, with the slides to which it is cemented, is washed in water (under a tap if desired) until the surplus stain is removed; it is then plunged into the combined decolorizer, and contrast stain made as follows:—

"Methyl-blue, 2.25 grammes; absolute alcohol, 30 c. c.; sulphuric acid, 12 c. c.; water, 100 c. c.

"Dissolve the methyl-blue in the alcohol, add the acid, mix the two solutions, and let stand, with occasional shaking or stirring, for twelve hours, then filter.

"The slide is moved up and down in this solution for a few seconds, and the section then viewed by transmitted light by holding the slide up between the operator and the sky. As soon as the blue coloration from the methyl-blue solution predominates over the red color of the fuchsin stain, the section is *immediately* washed in water.

"Generally, the red color will at once return, and if it does, the section and slide must be again plunged into the methyl-blue solution, and again washed.

"This alternate immersion in the methyl-blue stain, and washing in water, should be continued until, when washed in water, the red fuchsin color scarcely returns, as it is seen that the red stain has been permanently nearly replaced by the blue.

"This part of the process is the most difficult, and can only be mastered by successive trials. Generally, it is the tendency of a beginner not sufficiently to replace the fuchsin with the methyl-blue, in which case the red color of the bacilli will so blend with that of the tissues as to render them invisible. Once, however, the operator has acquired the proper experience, he will have no further trouble. When the section is sufficiently decolorized and stained in the methyl blue, it is thoroughly washed in water to remove all traces of the acid, for upon this depends the permanency of the stain. It is then, at once, dehydrated with *absolute* alcohol. The section should not be passed through diluted alcohol, but, after wiping the surplus water from the slide, it should be at once plunged into absolute alcohol, or else enough of the alcohol should be poured over it entirely and speedily to dehydrate it. The alcohol is removed with *turpentine*, and the process completed by mounting in balsam thinned with xylol.

"In case it is desired to stain sections cut by the freezing method, they are placed upon a slide on which a few drops of the gelatine fixative have been placed, and after about five minutes, during which the fixative will have penetrated the section, the surplus is poured from beneath the section. The slides are then set aside for the gelatine to harden by drying, and after drying they are placed in bi-chromate fluid to render the gelatine insoluble. They are then manipulated in exactly the same manner as the sections cut by the paraffine method.

"The process thus given in detail appears formidable, but in fact is easily carried out by one conversant with laboratory methods.

"The details have been carefully given, for it is by attention to them that the desired result of certain and clear staining of the bacilli is obtained. In this method, and especially after paraffine imbedding, the section being firmly cemented to the slide, no part of it is lost or torn, as is usual when handling by the method generally described. In the case of pulmonary tuberculosis, even the cells, from the accompanying catarrhal pneumonia, which lie loose in the alveoli, are shown in place, and the bacilli, which some of them contain, are clearly demonstrated.

"The stains given are also most excellent for staining sputa, and are to be particularly recommended on account of their certainty. With them sputa can easily be stained in five minutes. The sputa must be dried and flamed on the cover-glass as usual, and a few drops of the fuchsin stain applied, and the cover-glass heated until steam is given off.

"After washing in water, immersion for a second in the acid methyl-blue solution, and again washing in water, microscopic examination can be at once made by wiping the clean side of the cover, and placing the still wet sputa side down on a slide. If bacilli are found, and it is desired to preserve the specimen, the cover is removed and allowed to dry, after which it is mounted with xylol balsam.

"The method for sections is also applicable for tissues containing the lepra bacillus, they being stained with as much certainty and brilliancy as are the tuberculosis bacilli in tissues containing the latter."

Farbenfabriken vorm. Friedr. Bayer & Co.'s
Pharmaceutical Specialties

PHENACETINE-BAYER

Antipyretic
Analgesic, or
Anodyne

PHENACETINE-BAYER IS A TRUE AND DISTINCT ORGANIC DERIVATIVE, not a mechanical mixture. It is indicated in influenza (la grippe), in all fevers, with or without pain, rheumatism and rheumatoid maladies, neuralgia, bronchitis, phthisis, pertussis, and the gastralgias. Phenacetine-Bayer acts promptly, and is both safe and effective. It is supplied in ounces, tablets and pills.

SULFONAL-BAYER

Hypnotic
Antineurotic
Nerve Sedative

INSOMNIA OF ALL KINDS YIELDS PROMPTLY TO SULFONAL-BAYER. It is useful in simple insomnia and in the cerebral disturbances of insanity. It is a pure hypnotic, a safe and effective remedy, and it does not give rise to a drug habit. As its action is slower than that of the narcotics, it must be administered properly (*see pamphlet*). Sulfonal-Bayer is supplied in ounces, tablets and pills.

EUROPHEN

(A CRESOL-IODIDE IODOFORM SUBSTITUTE)

Antiseptic
Antisyphilitic
Local Stimulant

AS A SUBSTITUTE FOR IODOFORM, Europhen is winning an enviable place in therapeutics. It has a special value in specific lesions; while as a surgical dressing in ulceration, open wounds, and septic conditions of the cavities, it has given excellent results. It is supplied in ounces. Europhen-Aristol, a combined product consisting of equal parts of each medicament, is also supplied in ounces.

ARISTOL

(A THYMOL-IODIDE IODOFORM SUBSTITUTE)

Antisuppurative
Antiseptic
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CONTENTS OF LIPPINCOTT'S MAGAZINE FOR JUNE.—"John Gray; a Kentucky Tale of the Olden Time," by James Lane Allen; "Early Editorial Experiences" (Journalist series), Murat Halstead; "Being his Mother" (a poem), James Whitcomb Riley; "Westward the Course of Empire Takes its Way," Hon. John James Ingalls; "At Dead of Night" (a poem), Carrie Blake Morgan; "Concentration" (a poem), Ella Wheeler Wilcox; "Smithers," Maurice Thompson; "Frost" (a poem), St. George Best; "The Great American Desert," William F. G. Shanks; "A Study from Life" (a poem), Susie M. Best; "On the Idaho Trail," William Y. Lovell; "La Crosse" (Athletic series), Frederick Weir; "The Woman of the Plains," Patience Stapleton; "The Struggle for the West," Prof. John Bach McMaster; "Before the Storm" (a poem), Robert Loveman; "Curious Mixtures" (Composite photographs); "As it Seems;" "With the Wits" (illustrated by leading artists).

A CHOICE LIST OF SUMMER RESORTS.—In the Lake regions of Wisconsin, Northern Michigan, Minnesota, Iowa, and the two Dakotas, there are hundreds of charming localities pre-eminently fitted for summer homes. Among the following selected list are names familiar to many of our readers as the perfection of Northern summer resorts. Nearly all of the Wisconsin points of interest are within a short distance from Chicago or Milwaukee, and none of them are so far away from the "busy marts of civilization" that they cannot be reached in a few hours' travel, by frequent trains, over the finest roads in the Northwest—the Chicago, Milwaukee, & St. Paul Railway, and Milwaukee & Northern:—

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For detailed information, apply to any coupon ticket agent, or send stamp for a free illustrated tourist folder, to Geo. H. Heafford General Passenger Agent, Chicago, Ill.

MALTED MILK.—The Malted Milk Co. desire to call the attention of the medical profession to the following letter:—

"*Malted Milk Co., Racine, Wis.:*—

"In January I was attacked with influenza and pneumonia. During the convalescence I was very weak. I bought a 6 lb. jar of your Malted Milk, and took two tablespoonfuls of the same every five hours. In a short time I regained my strength and was able to take up my practice again. At bed-time I take two heaping tablespoonfuls of the Malted Milk in a cup of hot coffee, and then I can sleep all night. When I make a trip into the country (I am a country doctor), I always take a cup of coffee and Malted Milk, also when I return. By doing this I gained 23 lbs. in four weeks, and I also feel well. I do not say that the Malted Milk is altogether responsible for this, but it certainly aided me wonderfully.

"By taking malted milk in hot coffee I have a nutritious drink, as pleasant as a cup of chocolate, as delicious as a cup of cocoa, and as stimulating as a cup of eggnogg.

"With many thanks I remain, Yours truly,
"Dr. E. J. Kempf.

"*Jasper, Ind., Feb. 27th, 1892.*"

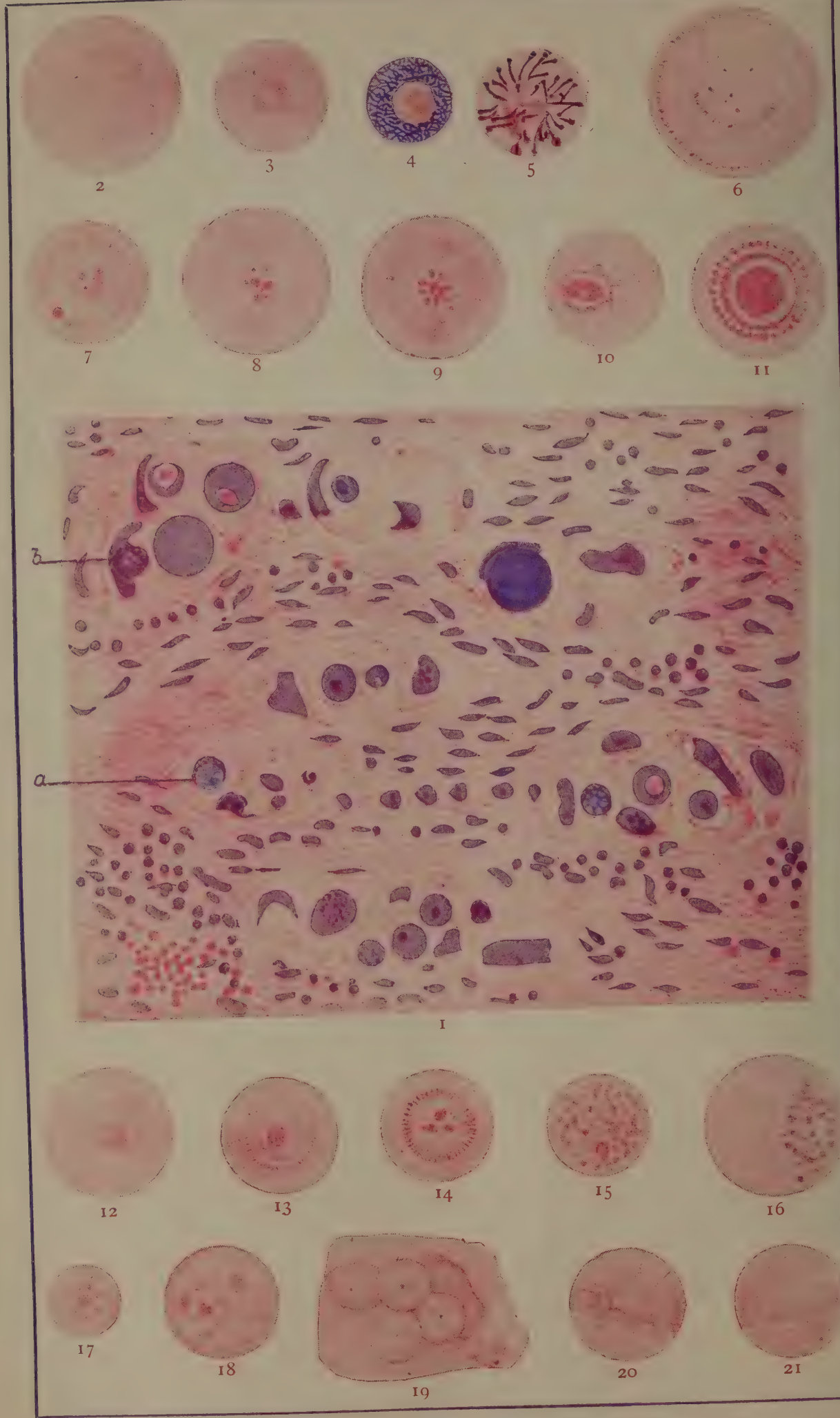
We publish the above in full, as it contains suggestions which will be of value to many physicians. Samples of this preparation are furnished free on application to the manufacturers.

INTERNATIONAL CONGRESS OF GYNECOLOGICAL OBSTETRICS.—This newly proposed association in the interest of a special branch of medical science will be organized next September.

This new association will doubtless prove a great success, as it will bring together a large number of the foremost gynecologists of the world. We have received the following note from the American secretary of the association:—

"The following named distinguished gentlemen have been delegated to represent the British Gynecological Society at the International Congress of Gynecology and Obstetrics, to be held in Brussels, Belgium, September 14 to 19, 1892: Robert Barnes, A. S. Simpson, Granville Bantock, Lawson Tait. Great preparations are being made to entertain visiting physicians. His Majesty King Leopold will assist at the opening of the Congress. There will be a grand reception by the Belgian Gynecological Society; gala performance at the Grand Opera; also a banquet by the Belgian Gynecological Society; garden party in the gardens of the royal family, etc.

"For information relating to the Congress, address Dr. F. Henrotin, American Secretary, 353 La Salle Avenue, Chicago, Ill."



CANCEROUS CELLS—Showing Inclusions of Parasitic Neoplasms. (See page 266.)

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., JUNE, 1892. NO. 8.

ORIGINAL ARTICLES.

THE STUDY OF IMMUNITY.

BY M. METCHNIKOFF.

IMMUNITY OF RABBITS VACCINATED AGAINST THE MICROBE OF HOG CHOLERA.

WHERE do the microbicidal forces reside in the refractory organism? Are they in the humors, or in the alimentary cells, notably the phagocytes which destroy the microbes? Such is the capital question which has been aimed at in the researches of this period on immunity.

The four first monograms which I have published, have been devoted chiefly to the solution of this problem. After having demonstrated (see articles 2 and 3) that in the case in which any phagocytory action exists (as in the charbon of pigeons and rats), where phagocytes play an incontestable role, it has been found necessary to prove that these cells destroy the bacteria englobed in a state of life. This proof has been furnished several times for the charbonous bacteridia, and for other microbes, particularly the *vibrio Metchnikowii,* after which the objection that the phagocytes would not be capable of englobing the dead microbes, was definitively refuted.

On the other hand, it has been proved that the theory which attributes bactericidal action to substances circulating in the blood, or secreted by cells in the vaccinated organism, is not confirmed by the study of immunity. The facts invoked by certain savants (Emmerich and de Mattei), as demonstrating the existence of liquid secretions which would destroy bacteria in a very short time (from 20 minutes to two hours), have been demonstrated to be inexact. (See our first article.)

The best argument drawn in favor of the theory of the bactericidal property of the humors, is that which is derived from the property of the serum of guinea pigs vaccinated against the *vibrio Metchnikowii.* It has, however, lost all its importance the moment it has been proved that this bactericidal force does not manifest itself in the vaccinated guinea pig. (Fourth article.)

The facts which I have just cited, as well as a great number of others, established during the last years, have furnished the definite proof that *the bactericidal forces of the organism reside in the phagocytes and not in the humors.*

But the discussion of the problem of immunity, concentrated in the first place on the question of the bactericidal property of the organism, has led to the deepening, very greatly, of the analysis of the phenomena of the refractory state. The humoral theory of immunity has demonstrated two new factors in the production of the refractory state, namely, the property of humors which attenuate microbes, that is to say, prevent the production of toxines. The other property is that which destroys toxines which have not been interfered with in their production. There are two ramifications of the humoral theory: *the theory of the attenuating property,* and the *theory of the antitoxic or toxinicide property of the humors,* which have been adopted.

Concerning the attenuating property of humors, its study is simple, because of the facility of separating the bacteria cultivated in the humors of vaccinated animals from these media of culture,

The researches on the anti-toxic properties of humors are more difficult. Discovered first in the humors of animals vaccinated against tetanus and diphtheria (Behring and Kitasato), this property was afterwards attributed to the sanguineous liquid of the rabbits vaccinated against the pneumococcus (G. & F. Klemperer.)

But diphtheria and tetanus present to us types of maladies essentially toxic,

with special localization of the bacilli which provoked them. The pneumococcus has the defect of producing very weak toxines and exceedingly inconstant in their action.

I have therefore been induced to choose another species of bacteria, in order to study the role of the anti-toxic properties of the humors in acquired immunity. I have used the microbe of hog cholera, or the pneumo-enteritis of the hog. This bacteria provokes in rabbits an acute disease, accompanied with considerable generalization of the microbe. It produces very active toxines, which act with regularity. The rabbit is very sensitive to hog cholera, and can be easily vaccinated against this disease, and furnishes quantities of blood absolutely sufficient for the study of the anti-toxic property. Another advantage of hog cholera, is the facility with which even small doses provoke a fatal malady in guinea pigs.

My studies have been facilitated by the excellent work of M. Selander, executed under the direction of M. Roux. I have been able, repeatedly, to realize the exactness of his work.

The microbes which have served for my researches, emanated from the epidemic which ran among the hogs in Gentilly, which had been placed at my disposal by Prof. Chantemesse, to whom I hasten to express my thanks.

I.— THE MICROBE OF HOG CHOLERA AND ITS TOXINE.

The microbe of hog cholera, studied by a considerable number of observers (Salmon, Cornil, Chantemesse, Frosch, Selander, B. Afanassieff, etc.), must be placed among the genera coccobacillus; it can be designated under the specific name of *coccobacillus suinum*, and it is characterized by the most pronounced pleo-morphism. The downward extremities transform themselves into more or less lengthy filaments, but may also give rise to veritable cocci. The truly spherical form of the latter is apparent, particularly in the individuals in which only a half has retained the color (methylene blue), while the other half has remained colorless.

But it is not only the alternations of filaments with bacilli and cocci which is observed in the evolution of the microbe of hog cholera. In special conditions of culture (which will be explained in Chapter IV), this microbe takes the form of true streptococci. We then observe more or less lengthy strings of beads composed of oval cells, or, which is more common, round cells. In the latter case, we surely have to do with spherical vegetative forms, and not with arthrospores, as had been suspected in other cases of pleomorphism.

The variability of the microbe of hog cholera is manifested again, under other conditions: In cultures made in broth, the cocco-bacillus is extremely mobile. In cultures prepared in the blood, or in blood serum, as well as in the animal organism, the same microbe is entirely deprived of movements.

It is not intended, in the plan of this study, to explain the morphological and cultural characteristics presented by the cocco-bacillus suinum. Accordingly I will entertain the reader only with the property of this microbe to produce in the blood of unaffected rabbits some very active toxic poisons. This discovery has been made by M. Selander. After having strengthened his virus by successive passages through the pigeon, M. Selander has observed that the blood of rabbits having succumbed to an excessively acute infection, when heated to from 54° to 58° C. produces in the rabbits a very characteristic mortal intoxication. Between the variance of the microbe and the toxicity of the blood heated to 60,° he had observed a complete parallelism. The more the microbe is varied, the more the heated blood manifests toxic properties. This blood heated to more elevated temperatures, loses its toxicity. When carried to 100° C., it becomes completely inoffensive. In this respect the toxine of the microbe of hog cholera is related to that of diphtheria and tetanus,

In the rabbits, the morbid phenomena which succeed acute infection produced by an injection of very virulent virus, correspond perfectly to the tableaux of mortal intoxication produced by an intravenous injection of toxic blood. In both cases, the rabbits appear sick early after the injection. The temperature presents a temporary elevation followed by hypothermia, which is prolonged until death. In the most acute cases, the temperature begins to decrease immediately after the injection of the virus or toxine. The leucocytes diminish in both cases, in great proportion. Respiration

is at first very greatly accelerated, and decreases only before death. Paralysis, which begin sat the posterior extremity and extends to the anterior portion of the body, as well as the pre-mortal convulsions, complete the resemblance between the picture of the infection and that of the acute intoxication. Autopsy in both cases give the same results,—for the most part, negative. The internal organs present hyperæmia; the spleen is a little hypertrophied; the urinary bladder is empty, only a microscopical examination reveals at once the great difference. While the blood of the intoxicated rabbits is completely sterile (results verified by cultures), that of infected animals contains immense quantities of microbes of hog cholera in the form of diplococci, of short, oval bacteria, or of veritable cocci.

There can therefore be no question that the cocco-bacillus suinum produces abnormal, toxic substances in the body of rabbits, and that this toxine resists a temperature of from 54° to 58°, and even to 60° C., and while the intra-venous injections of large doses (beginning with 1.5 c. c. of blood heated) produces in guinea pigs a mortal intoxication, the introduction of lighter doses into the blood circulation or into the subcutaneous tissue, repeated several times, confers solid immunity to the rabbit against extremely mortal virus. This result, obtained for the first time by M. Selander, has been confirmed several times in my own researches.

The process of vaccination by heated blood indicated by this author, has served me for vaccinating a great number of rabbits. In anæmic injections, at intervals of several days, and sometimes several weeks, and in the introduction of total quantities twice as large as the smallest mortal dose, I obtained positive vaccination, without having a loss to record.

(To be continued.)

Pleuritis Ani.—Dr. Dumesnil, of St. Louis, recommends for this distressing affection, the following mixture: Corrosive sublimate, ½ gr.; ammonium chloride, 20 gr.; carbolic acid, 1 dr.; glycerine, 2 oz.; aqua rosacea, 4 oz.

To be applied morning and evening. In obstinate cases in which the skin is thickened, a single application of pure creosote is made.

DOUBLE CHANCRÈ A DISTANCE.—AN INQUIRY INTO SYPHILITIC AUTO-INOCULATION.

BY A. H. OHMANN DUMESNIL,

Professor of Dermatology and Syphilology in the St. Loui College of Physicians and Surgeons.

THE question of auto-inoculation in syphilis was, at one time, a fruitful theme for discussion and led the way to numerous experiments of the greatest importance, when viewed in the light of the results that were achieved. After a lull of several years the question has been revived in latter years but in a different form. It is one of the highest importance from the fact that, should it be established that auto-inoculation is possible, during a certain limited period, it would conclusively prove that the disease was still localized, and the very fact that this localization existed would render reasonable attempts to jugulate syphilis by means of early excision of the chancre and of the indurated ganglia anatomically connected with it. The following cases are interesting as bearing in some respects upon the question of auto-inoculation, and as affording examples of a clinical variety not frequently met with.

Case 1.—Mr. B.——, about 22 years of age, contracted a chancre, and presented himself to Dr. A. C. Bernays for treatment. I saw the patient at this time. He could not fix the probable time of infection. Upon examination he presented a well-marked chancre of the prepuce on the right side. The induration was well defined, and the inguinal ganglia of the corresponding side were also indurated. In the center of the lower lip he presented a sore having the size of a silver half-dime, well-defined, of a roundish shape and implicating a small portion of the mucous membrane and vermillion border. On both sides of the inferior maxillary the lymphatic glands were enlarged and indurated. More especially was the condition marked upon the left side. The induration of the labial sore was very distinct. Patient was subject to fissures of the lower lip. He was not aware of handling his preputial sore and transferring the virus to his lip. In fact, he rather thought he did not. In about two months after, a marked secondary eruption appeared, and his hair fell out. Both chancres healed spontaneously

and simultaneously, the induration disappearing in the sores and lympathic glands at the same time.

Case 2.— Mr. C. —— presented himself to me for treatment, Dec. 22, 1886. He presented two chancres. One was situated upon the mucous surface of the left side of the prepuce and extended to the border. It was somewhat larger than a silver dime, the induration being plainly apparent to the touch. The lymphatic glands in the left groin were enlarged and indurated. The other chancre was situated in the center of the upper lip and was a little smaller than a silver dime. The induration was very marked, so much so that it partially everted the lip. The lymphatic ganglia beneath the inferior maxilla were indurated, not so markedly so upon the left side as upon the right. Those on the right, however, were plainly enlarged. Upon inquiry the fact developed that the upper lip was almost always fissured at its central portion in winter, and had been in that condition for quite some time before the appearance of the sore. On Feb. 22, 1887, two months after the patient first presented himself, a fine, papular eruption made its appearance. Upon the face, back, and legs were pustules scattered here and there. Mercurial treatment caused these to disappear in a couple of weeks, but it was not until March 12 that the induration of the glands, and the chancres disappeared completely. The *restitutio ad integrum* was simultaneous in both localities. Inquiry elicited the probabilities of the simultaneous appearance of both sores. At least, as far as the patient knew, they came on at the same time; but he was naturally more solicitous concerning the sore upon his prepuce, regarding the other as merely an ordinary sore due to irritation of the fissure.

Multiple chancres are not rare by any means. They are quite frequently seen, if we are to believe the statistics of those who see many cases of syphilis. Of course, the relative percentage is not great in comparison with the grand total, but an observer who has not seen this condition has not had many cases under his care. The same may be said of extra-genital chancres and more especially of chancre of the lip. The condition, however, which I have detailed does not seem to be one that is frequent; in fact, it is a most unusual one; viz., to have chancre of the prepuce and of the lip occur simultaneously. While genital and buccal mucous patches often occur synchronously, the primary lesion of syphlist does not seem to affect parts so distian from each other, nor those particular portions which I have mentioned. On this very point F. N. Otis, speaking of extra-genital primary lesions, says, "Usually they (chancres) are rare in proportion to their distance from the genitalia." How much rarer must this condition be when the case is one of multiple chancres, at such a distance from each other!

An interesting question which is now suggested is this: In the cases reported above were the chancres of the same age and due to the same inoculation in point of time? or was there auto-inoculation? A consideration of this would lead us to a critical examination of the question of auto-inoculation, and the success which has attended attempts to establish the truth of its probability. I do not intend to discuss these questions exhaustively, but merely analyze a few points and point out some possible sources of error. In my opinion, in the two cases which I have briefly outlined, the chancres of the lip and of the prepuce in each case were of the same age and inoculated simultaneously. My reasons for this are founded upon the fact that the induration of the sores and of the ganglia occurred at about the same time so far as this was observed. In the next place, the induration disappeared exactly at the same time, both in the lymphatic glands and in the chancres. In other words, while the appearance of the induration could not be exactly determined, the synchronous disappearance was observed; and this in two cases. Had either one of the chancres been due to an inoculation from the other, we would expect its induration to appear and disappear as much later than that of the primary infecting focus as the period intervening between the appearance of the one and that of the other.

Now let us examine the evidence adduced to support the possibility of auto-inoculation, and then we will consider the probabilities.

P. A. Morrow says, "The initial lesion is unique; multiple chancres are, however, by no means rare; they may be grouped in the same region, or be disseminated over different portions of the body.

"Multiple chancres are almost always due to the simultaneous inoculation of a number of rents or abrasions; they are not produced by successive inoculations, as in the case of chancroid.

"The *non-auto-inoculability of the chancre* is a rule to which there are few exceptions, and these only possible when inoculation is performed at an early period after the appearance of the chancre; the result is usually an abortive pustule."

E. L. Keyes has about the same opinion in this matter. He states that, "When the chancre is quite young, and the organism presumably not saturated with syphilis, some of the poison taken from the patient's own chancre may be successfully auto-inoculated, producing a second characteristic chancre upon him. (Puche, Wallace, Sperino, Bidenkap, Lee, and others.)"

In Bumstead and Taylor, the main issue is avoided to some extent, as witness from the following: "If multiple at all, it is almost always true that they (chancres) are so as the immediate effect of contagion, and because several rents or abrasions were inoculated together in the sexual act. If solitary at first, they continue to be so; since successive chancres rarely spring up in the neighborhood, as in the case of chancroid, owing to the fact that the virus ceases to act upon the system as soon as it is once infected."

Of course, the question is, When does the system become infected? or, in other words, what is the limit to the period when auto-inoculation is possible, or is it possible at all?

The possibility of auto-inoculation from the primary sclerosis is doubted by a number of good observers. Fournier, in giving the differential diagnosis of simple and syphilitic chancre, states that in the latter the pus is not auto-inoculable. H. Leloir says that "the infecting chancre is not inoculable on the carrier of it, and this last proposition may be laid down as an invariable rule (*une règle absolue*); this characteristic of the non-inoculability of the infecting chancre is of the highest importance, and may be considered as pathognomonic." He adds a note in which he states that, in some exceptional cases, auto-inoculation *seems* to have succeeded.

H. G. Piffard says that the "chancre is not, as a rule, inoculable upon a person bearing it, or upon another who is already syphilitic."

Berkeley Hill in speaking of the primary sclerosis of syphilis says that "the papule is habitually solitary. When there are more than one, the papules are all of one age," implying that all were inoculated at the same time.

Alfred Cooper in considering the same question states that "if several hard chancres are found upon the same person, the probability is that they have become simultaneously developed; for a sore of this character is not inoculable, as such, upon the subject of it."

Jonathan Hutchinson does not seem to be very favorably impressed by the doctrine of auto-inoculation. In referring to the multiple chancres he says that, "The number of these indurated spots, or chancres, will depend upon the number of different places which were inoculated at the *same time*, just as is the case with vaccination vesicles. It is not very often that more than one is seen, and if there be two, three, or more they *are always at the same stage of progress at the same time. No new ones are ever produced subsequent to the full development of the first.*[1] If for the sake of experiment it were attempted by direct inoculation to produce others, the attempt would fail; just as we should fail to re-vaccinate an infant, on the eighth day, from his own spots." While we see that the possibility of auto-inoculation is mentioned, the author makes some pretty positive statements to the contrary. I will make another quotation from P. A. Morrow, in which he states that "the non-inoculability of the secretion of the chancre is the rule to which there are few exceptions and these only possible when inoculation is performed at an early period after the appearance of the chancre. The four or five cases reported in which positive results have been obtained from auto-inoculation of the chancre are of doubtful authenticity; the almost invariable result is an abortive pustule. A distinction is always to be recognized between the specific serous secretion of the chancre, and the inflammatory products of this same lesion when irritated into copious suppuration."

With this I will close citing authors,

1 It is possible that certain rare exceptions to this statement may occur.—H.

although a number of others holding similar opinions could be quoted. Admitting the auto-inoculability of the chancre for the sake of argument, the question which presents itself is this: At what time does the susceptibility cease, or, in other words, when is syphilis constitutional? The rapid recital of a few cases may throw some light upon the subject. After this I wish to make a critical analysis of a few of the reported successful cases of auto-inoculation.

(To be concluded.)

PROTOPLASMIC FOCI-THEORY OF METABOLISM.

AN ELABORATION OF THE VIEWS CONTAINED IN THE PAPER READ BY DR. MORTON AT THE FIRST MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

BY HORATIO R. BIGELOW, M. D.

(Continued.)

IN Foster's "Text Book of Physiology" it is written: "Urea is the main end product of proteid metabolism. Unlike hippuric acid, and some other constituents of urine, urea is simply excreted by the kidneys, being brought to them in the blood, they apparently, beyond the simple act of excretion, doing no more than merely contributing to the stock of urea in so far as they are masses of proteid material undergoing proteid metabolism as part of their general life. What are the immediate antecedents of urea we do not clearly know; but it is probable that they are not one, but several, and indeed possibly many. We have reason to think that urea may be formed out of amides or amido-acids, or out of ammonia itself by a synthetic process; and we have indications that this synthesis is effected in the liver by the agency of the hepatic cells. But we do not know whether this synthesis bears only on particular nitrogen-holding substances of food or of the body, or whether it comes into play in the normal metabolism of proteid material. If the kreatin, which is so conspicuous a constituent of muscular and nervous structures, is a stage in the direct line to urea, then the synthesis would affect only the sarcosin which the kreatin in becoming urea sets free. . . . The evidence, as far as it goes, tends to show that the metabolism of proteid is very complex and varied, that a large number of nitrogen-holding substances make a momentary appearance in the body, taking origin at this or that step in the downward stairs of katabolic metabolism, and changing into something else at the next step, and that the presence in various parts of the body and in the urine, in small quantities, of so many varied nitrogenous crystalline substances forming a large part of what are known as extractives, has to do with this varied metabolism. Possibly the transformations by which nitrogen thus passes downward take place to a certain extent in such organs as the liver and the spleen, which are remarkably rich in these extractives. But the whole story of proteid metabolism consists at present mostly of queries and gaps."

Mc Kendrick (Text Book of Physiology) says: "The question whether urea may arise from decomposition only, or from the synthesis of products of decomposition, is still unsettled." The same author writes: "The formation of organic substances by synthesis in the living animal body is still very imperfectly understood, but it is interesting to observe that many nitrogenous organic compounds have been formed synthetically by the chemist in the laboratory. Thus urea, hippuric acid, glycocin, taurin, sarcoin, kreatin, glucose, and oxalic, lactic, succinic, benzoic, propionic, acetic, and formic acids have been formed artificially; but as yet it has been impossible to prepare the higher members of the series. It is probable that in the living body more of the nitrogenous compounds are formed by analytical than by synthetical processes. One well known example of a synthetical process is the formation of hippuric acid after the introduction of benzoic acid with food in medicine. In these circumstances, benzoic acid unites with glycocin to form hippuric acid, which makes its appearance in the urine —

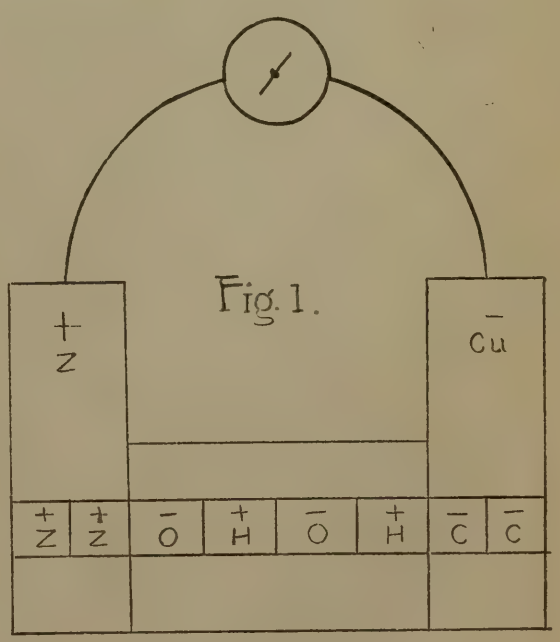
$$\underset{\text{Benzoic acid.}}{C_7H_6O_2} + \underset{\text{Glycocin.}}{C_2H_5NO_2} = \underset{\text{Hippuric acid.}}{C_6H_9NO_3} + H_2O$$

. . . Syntheses play an important part in building up the complex bodies existing in living matter, and we may consider that substances so all-important as fats, lecithin, and other compounds existing in nervous matter, hæmoglobin itself, and albuminous bodies, are thus formed. How such processes are accomplished is not known, nor must we suppose that

there is only one way by which a complex chemical substance may be formed. It has been conjectured that the elimination of water plays an important part in synthetic operations, and that the bodies thus formed may be regarded as anhydrites of substances produced by the combination of the simpler bodies. Much of our knowledge on these points is still obscure, but it is remarkable that the triumphs of chemical science are in the synthetic production of complex organic bodies, and it is not unlikely that each successive step in this direction will lead to a better understanding of the similar processes occurring in the body in the upbuilding of its tissues."

These excerpts and reflections are absolutely necessary to a proper conception of the views advanced and defended in the masterly paper of Dr. Morton — a paper which takes rank among the most original and scholarly professional efforts of the past few years. I think also it may be conceded that, in the main, these theories of Dr. Morton — theories as yet, because it is impossible to prove them inductively — are correct. We have reason to believe that clinical observation, that the study of the conditions giving rise to pathological changes, both bear witness to the electrical polarity of disease. Chemism itself, it may be, is only another name for polarity, and affinity is simply an affirmation of the electric conditions of the molecules, which by reason of this polarity attract or repel each other. "Contact force" has a small following nowadays, because absolute contact cannot be imagined. There must always be an interposition of the surrounding ether between atoms and molecules, no matter how nearly they approach each other. It is true that certain metals when placed in contact manifest certain electrical conditions of polarity, and just why this should happen the physicist does not know. It is not impossible that the interposed strata of ether sets up the change by releasing a latent energy of the metal which only needed a stimulus to set it free.

It is important to find out at just what point in a voltaic cell the chemical action begins. It is held now, I think, by most physicists, that the real starting point of the current is in the cell at the surface of the zinc where the chemical action is furnishing energy; "for from this point there are propagated through the liquid certain electro-chemical actions which have the result of constantly renewing the difference of potential and supplying electricity to the + pole just as fast as that electricity leaks away through the wire to the — pole. At the same time it will be noticed that a few bubbles of hydrogen gas appear on the surface of the copper plate." To explain the transfer of matter through the liquid of the cell, Grotthuss advanced the hypothesis that the first effect produced in the liquid is that its molecules arrange themselves in innumerable chains, in which every molecule has its constituent atoms pointing in a certain direction; the atom of electro-positive substance being attracted toward the kathode, and the fellow atom of electro-negative substance being attracted toward the anode; that an interchange of partners (Thompson) goes on between the separate atoms all along the line, each H atom uniting with the Cl atom belonging to the neighboring molecule, a + half molecule of hydrogen being liberated at the kathode, and a — half molecule of chlorine at the anode. Clausius endeavors to bring the ideas of Grotthuss into conformity with the modern kinetic hypothesis of the constitution of liquids. These changes are well illustrated in the rough sketches which Dr. Morton sent me for private study, and which would have been elaborated, no doubt, had he known that I should thus publicly make use of his handiwork.



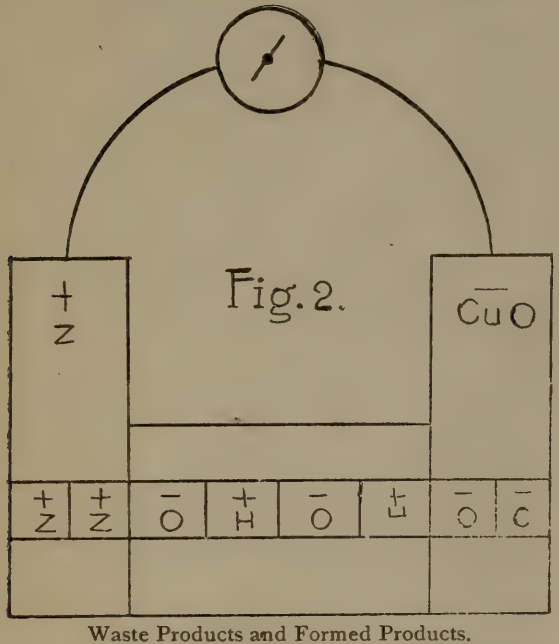
Analysis and synthesis.

Waste Product.

The zinc, ZnO destroyed, katabolism.

The electrolyte, O----- H destroyed, katabolism.

The copper, Cu. reduced, anabolism.



Waste Products and Formed Products.

Waste Product.

The zinc, ZnO destroyed, katabolism.

The electrolyte, O----- H destroyed, katabolism.

The electrolyte, O+H synthesis, anabolism.

The oxide of copper, CuO ≡ H_2O formed product, synthesis anabolism.

The electrolyte in Fig. 2 is first decomposed, as a result Z n O, a "waste product or not" (say urea), is synthetically formed (as you say), but by oxidation and therefore as I understand it katabolically formed. Next the H unites with the O of the oxide of copper and forms H_2O, a waste product (oxide of hydrogen). Or both products are synthetical; if they are "end products" they are also "waste products." So, as I understand katabolism to mean oxidation or combustion, it may form waste products (end produots) like CO H_2O, urea, uric acid, etc., or other products like glycogen, etc.

THE WORK OF A LIVING ANIMAL ORGANISM.

[From a private communication from Dr. Morton, Feb. 3, '92.]

Primarily by katabolism.

(*a*) *Heat*, which undergoes no further transformation.

(*b*) *Electromotive force, current electricity*, detected by current of repose of muscle or nerve and occupied in storing chemical energy for purposes of function in muscle, nerve, and gland.

Secondarily or upon the exercise of function.

1. In contraction of muscle.
 (*a*) *Heat*, secondary.
 (*b*) *Electricity*, current of action or negation oscillation.
 (*c*) *Mechanical work.*
2. In nervous impulses and function of nervous substance.
 (*a*) *Heat*, secondary.
 (*b*) *Electricity*, current of action or negative oscillation.
 (*c*) *Nerve impulses, cerebration*, etc.
3. In glandular activity.
 (*a*) *Heat*, secondary.
 (*b*) *Electricity*, current of action and negative oscillation.
 (*c*) *Secretion.*

There are two sources of heat, one primary, the other secondary; the latter due to the same explosion or decomposition which produces the function of the part and the electrical reaction.

The primary heat is due to chemical combination (exothermic compounds).

The secondary heat is due to chemical decomposion (endothermic compounds).

The primary is not associated with function.

The secondary is associated with function.

(To be concluded.)

PHYSIOLOGICAL HYGIENE.

BY PAUL PAQUIN, M. D.

It is too true, we are bound to acknowledge, that the vast majority of chronic maladies that come under the care of medical practitioners, fail to get any relief whatever, and steadily grow worse and worse under our daily administration of this or that drug, this or that recommendation, which we prescribe to relieve or to satisfy the anxiety of the patient, rather than with the hope of doing him much good. Such cases are those from which we derive the least satisfaction in the practice of medicine; they give the greatest uneasiness and annoyance to the practitioner, and the latter get the least benefit for their pains. Is it possible for the general practitioner to adopt a general mode of treatment more in accordance with the advances made in our knowledge of physiology? It certainly is, in a great many cases; but the practice presupposes a better knowledge of physiology, in a good many cases, than most of us possess, at the outset of our career at least. Physiological means of treatment are no more to be followed as stereotyped formulas in any case presenting a given condition than we should adopt stereotyped medicinal prescriptions. Judgment must be used in their application, and this judgment must depend on our knowledge of the physiology and the pathology of the organism presented.

So the first step to be taken in individual progress of medicine, in order that the best success be obtained by all the means at command, and the greatest good may follow, is a better, and broader knowledge of the physiology of man, and the physiology of the organisms with which he comes in contact, particularly the microbes. This can be obtained largely in practice, but it is the duty of the medical schools to give a much broader foundation, a much deeper groundwork to students, upon which to erect their medical education.

We have now in the country many places where chronic cases in which the medical practitioner fails, can be cared for. They consist of institutions generally known under the name of sanitariums, health resorts, etc., in which facili-

ties for the application of physiological means, such as baths, electricity, massage, Swedish movement, and the regulation of diet are of a superior order, and can be applied with accuracy, wisdom, and under the guidance of science. These institutions are undoubtedly the best centers for the treatment of chronic patients, because usually more time, care, and constancy are required to apply the remedies than the average practicing physician is prepared to give, and also because most of them have not the proper appliances nor the rooms for them. Trained nurses for this treatment are necessary, and do quite as well as the practicing physician, when the treatment is based on a scientific prescription.

So it is to be hoped that the younger men of the profession, particularly those who are laying the foundation for a medical education, will take into very serious consideration the fact that they cannot be fully successful, and cannot render the fullest amount of service possible or attainable in the practice of medicine, unless they prepare themselves by first obtaining a thorough knowledge of the physiological laws underlying life in all its activities, and then base their practice of medicine thereon. Understanding physiology well, it is not difficult to understand pathology, and comparatively easy to realize what treatments should be pursued in the various cases which may confront the physician.

Physiological medicine is the only true path of medical practice. It places the physician in his right place, suggesting very forcibly to the doctor, who usually considers himself a curer of disease, that he is only an assistant of nature when enfeebled.

Treatment of Tuberculosis by Aristol.— At a recent meeting of the Therapeutical Society of Paris, Dr. Vogt presented the report of the committee appointed by the Society to investigate the method of treatment of tuberculosis by aristol, devised by Dr. Nadaud, of Mentone. The report was favorable to the method. In twenty-three cases of tuberculosis, a cure was effected in seven cases. In these cases the treatment had lasted from twenty-five to thirty days, and the patients were still well although three or four months had elapsed since the treatment was discontinued. In five cases there had been rapid improvement under treatment, but relapse during the month which followed its cessation, requiring a renewal of the treatment, after which they had remained well, a third series of treatments never having been called for. In three cases in which there were large cavities, two had died, one of diphtheria, and the other of tubercular peritonitis. Those of the patients still under treatment were materially improved. By the use of aristol the cough is controlled, expectorations lessened, the night sweats disappear, the appetite returns, the weight is increased, and the general conditions of the body are improved. A one-per-cent solution of the remedy in oil of sweet almonds is the form in which it is used, the solution being injected by means of the hypodermic syringe. It is claimed there is but little local pain, and never inflammation, induration, or abscess at the point of injection. In advanced cases the solution is modified by the addition of five per cent of purified creosote.

Statistics of Anæsthesia. — E. Gurt, (*Centralblatt für Chirurgie*, n" 26, p. 81, 1891) gives an account of the results in 22,625 cases in which different anæsthetics were employed. Six deaths from asphyxia occurred, of which all the deaths in 71 occurred in 22,656 cases of anæsthesia by chloroform. Five cases of grave asphyxia occurred in 1,055 cases in which a mixture of ether and chloroform was used.

Massage and Scanty Urination.— Dr. Marinel, of Brussels, has shown by practical experiments that Dr. Bum is correct in his view that the secretion of the kidneys is augmented by massage. Experiments of others have shown that massage increases the blood-pressure in the abdominal viscera. This may be one of the causes of the increased activity of the kidneys as the result of a general massage; but the authorities before referred to hold the opinion that the increased renal activity is due to another cause. They believe that, as the result of massage, various poisonous substances are made to enter the circulation by absorption from the tissues, and that the activity of the kidneys is thereby stimulated, it being well known that a large part of the work of the kidneys is the elimination of the albuminoid poisons thrown off by the tissues.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

INTRA-CELLULAR PARASITISM OF CANCEROUS NEOPLASMS.

BY M. SOUDAKEWITCH,

Prosector of the Institute of Pathological Anatomy, Kieff, Russia.

Translated, from *Annales de l' Institut Pasteur*, by Paul Paquin, M. D.

(SEE FRONTISPIECE.)

(Concluded.)

THE little masses became surrounded by a new coat, sometimes homogenous, and again, finely granular (see frontispiece, Figs. 4, 5, 8). In certain cases we observed, besides, a new ring with slim and regular internals (Fig. 13). Some exhibited at their periphery a kind of thin or thick ray; these were either uniform in body and sharp at their extremities, or had slight enlargements at the ends (Figs. 5, 6, 7, 11, 13, 14). The external capsule contained another ring, not so regular, pleated, and, one would have imagined, collapsed on itself (Fig. 14). The rays of certain bodies were longer, could be colored with hæmatoxylon, and resembled pseudopodes very much (Figs. 3, 10). The capsule often contained more than one nucleus; sometimes there were many,— 6, 8, 12, and more. Their form was now spherical, then elliptical; and they sometimes slightly curved in the shape of rods with swelled extremities (Figs. 15, 18). Such capsules, containing several bodies comparatively voluminous, did not color with violet.

There were cells which contained several included bodies, up to 15. They were of about equal dimensions, each having a separate capsule. Their contents were sometimes alike, and sometimes different. Several times I have found cells in which inclusions were of different dimensions and different structure (see frontispiece of May number, Fig. 34, and frontispiece of this number, Fig. 19).

The cancerous cells with multiple inclusions were hypertrophied and attained great dimensions. Finally, the metastatic nodules contained capsules with multiple contents; the latter consisted of granulations, either fine and close together or arranged in filaments. The granulations colored deeply in violet by the use of hæmatoxylon. In the center or at the periphery of the granular mass, we could observe a little colorless protoplasmic patch (Figs. 20, 21).

There were also in the preparations, several identical forms of leucocytes enclosed in vacuoles.

Unable to describe the numerous forms in all their diversities, I will content myself with giving here exact figures (frontispiece), more demonstrative than any description. Fig. 1 represents a metastatic spot of the liver, comparatively rare. We could see in it, in one visual field, 28 different inclusions of variable size.

A superficial examination of the first preparations of this cancer showed me perfectly that I had to deal with a strange animal organism, and not with deformed nuclei, degenerative protoplasm, incorporated leucocytes, or invaginated cancerous cells. It was much more difficult to define the nature and the place of this being in the zoölogical system. . . .

I made sections from pieces of cancer of the last described case, after hardening them in Müller's fluid. I saw then that in these new preparations the indubitable sporozoa that I have just described, had another aspect,— for example, the phenomena of metachromatia, after coloration by hæmatoxylon, was scarcely observable.

The parasites were very numerous, but one could not discover in them any trace of the complicated structure described above. They resembled somewhat, the forms represented in the first plate.[1] They are mostly bodies resembling colloides closely, or resembling a mucous substance without the structure which we find in those preparations.

Such appearances could easily be intrepreted as coming from degeneration, as emanating from protoplasmic degeneration of the cancerous cells.

Among the material of the Institute of Pathological Anatomy, I have found, again, two cancers of the pancreas (one secondary after a cancer of the stomach, the other primary; both accompanied by metastasis of the liver), preserved in Müller's fluid. On examining the preparations made with this material, I understood the significance of these intra-cel-

1 The first half of the plate of frontispiece in May number.

lular inclusions, sometimes voluminous, that I had heretofore taken for modifications of nuclei or for a protoplasmic degeneration.

Figs. 35 and 36 (frontispiece of May) present most characteristic inclusions of these cases.

The tableaux were somewhat different in the case of a cancer extirpated from the kidney. Here the inclusions (see Figs. 37, 38, 39, 40, and 41, May number) had the aspect of spherical bubbles highly colored by hæmatoxylon: their contents were different.

The three cases which I have just mentioned (two of the pancreas, and one of the kidneys), as well as the fourteen other cases observed by me in the material of the *Institut* mentioned (cancers of the liver, of the mammary glands, of the testicles, and of the uterus), presented inclusions with an aspect similar to that of the formations which I regarded as true sporozoa. These observations proved further, that the first pancreatic cancer studied had a great interest, not only as an isolated case of cancer containing numerous true sporozoa, but also as a basis in the explanation of all other cancerous inclusions.

I fixed fresh carcinoma with Fleming's liquid and osmic acid. I constantly observed the presence of parasites. I have studied, to this date, 18 similar cases (cancers of the liver, the mammary gland, lachrymal gland, uterus, and inferior lip).

It is chiefly in the carcinoma of the liver (in the surgical clinique of Prof. Rineck) that I have found the greatest quantity of parasites. The cadaver was freshly received, so that the autopsy was made early after death, and microscopically demonstrated that the liver was completely invaded by a quantity of nodules, most of them small, and that the parenchyma was reduced to a minimum. There was no metastasis.

The cancerous cells were very large, and presented well marked giant asymmetric karyokinetic figures, hyperchromatism, etc. These cells contained now isolated parasites, then multiple parasites.

After prolonged coloration with safranine, a few colorations presented metachromatic phenomena, and took on a pale violet color (as in the observation of preparations of the nervous system after the method of Adamkiewicz). There were forms resembling very much the form of rays in the cancer of the pancreas (Figs. 19, 20, 28). Others were entirely original (Figs. 22, 23). Very frequently there were found here not only intra-cellular forms, but also intra-nuclear forms (Figs. 25, 26) of different dimensions.

In these cases, the cancerous cells contained parasites presenting very characteristic modifications; their nuclei were sometimes pressed back and contracted, and sometimes enlarged (resembling the *monaster* stage).

The cellular contours were irregular, as usual; but, besides this, they were provided with long and fine prolongations in the nature of pseudopodes. I do not pronounce yet upon this phenomena observed by me previously, on the inferior lip. I can only indicate an analogous modification of the renal epithelium of the *helix hortensis*, under the influence of the introduction of Klossia (Pfeiffer, *Protozoen als Infectioneserreger*, II Anfl. s 75, 76, 77).

Such are the forms which I have observed. In referring to them, I believe myself authorized to say that in all the 95 cases of cancers studied by me, I have found intra-cellular parasites of the class of sporozoa.

The presence of the parasite caused, on the one hand, a hypertrophy of the cell, and occasionally a modification of its protoplasm, and on the other, different modifications of the nucleus, often in the sense of karyokinesis.

It is only as a plausible supposition, that I may add that the parasites observed in different cancers belonged to different species.

An Improved Transfusion Apparatus.— Dr. Samuel Bernheim describes (*Bulletin General du Therapeutique*) an improved apparatus for transfusion, which he has employed in experiments in transfusion of the blood of goats as a means of treating tuberculosis. The various forms of apparatus heretofore proposed, have been operated either by a piston or by a rubber bulb, and have been more or less complicated. The apparatus employed by Dr. Bernheim has neither bulb nor piston, and is the simplest possible device. It consists simply of a piece of simple rubber tubing with a canula at either end. This apparatus is intended for arteriovenous transfusion. The ca-

nula designed for the patient is very small, so that undue pressure is prevented. The transfusion is accomplished by means of the arterial pressure of the animal, which is amply sufficient. The goat is employed in consequence of its immunity from tuberculosis. A large canula is introduced into the carotid artery of the goat, the small one into one of the veins of the arm which are commonly used in bleeding.

Of four cases reported, favorable results were observed in all. One died as the result of imprudence which produced an acute pulmonary congestion; the others were considered as practically cured. There may be a great future before this method of treatment, as it has been shown by numerous experimenters that the blood of one animal may replace that of another of the same class. Brown-Sequard brought to life a dog which had been bled to death, by transfusing the animal with the blood of pigeons. The experiment was repeated by Glenard twice with the same animal, using on one occasion the blood of a donkey, on another, that of an ox. With the simple apparatus above described, this operation is relieved of all its dangers, if reasonable care and prudence are employed; and it is quite possible that the time may not be far distant when the injection of goat's blood will be recognized as one of the most important measures in the treatment of tuberculosis.

Pure Creosote.— The rapid extension of the use of creosote, especially as a means of treatment in tubercular disease, gives special importance to the question of the purity of this drug. In a learned communication presented before the Society of Therapeutics of France, M. Catillon recently enumerated the following as the characteristics which should be possessed by pure beechwood creosote: —

1. The creosote must be completely colorless, and should remain uncolored for a long time, even when exposed to light, and in clear glass bottles.

2. The special odor should not suggest the odor of bitumen, and should be easily removed by washing with water.

3. The density should be 1080, at a temperature of 59° F.

4. It should give off nothing in distillation below 200° C., and should distill over entirely, between 200° and 212° C.

5. Mixed with equal parts of pure glycerine, it should dissolve without any turbidity or whitish opacity. The addition of water precipitates creosote from this solution. This solubility in water is about one part for 100 of water.

7. Creosote should be absolutely neutral, and a drop placed upon blue sunflower paper should not change it.

8. It must dissolve entirely in soda and potash solutions, and give a very limpid solution, even after the addition of water; mixed with an equal quantity of collodion it should not coagulate, but should give a perfect solution, which should preserve its fluidity.

9. When dissolved in ten times its volume of alcohol, the addition of a ten-per-cent solution of chloride of iron should give a faint green color, clear, and without any bluish tinge.

10. Mixing one cubic centimeter of creosote with ten cubic centimeters of a 1–50 solution of caustic potash in alcohol at 95° should give a solid crystalline mass.

According to the experiments of the author, creosote possessing the above properties is much more easily tolerated by the stomach than ordinary creosote, and can be taken without disturbance in doses twice as large as those which create serious disturbance when ordinary creosote is employed.

Creosote is much used in France in the treatment of tubercular affections, being employed hypodermically, dissolved in olive oil. M. Gimbert, who was the first to employ creosote by hypodermic injections in large quantities, uses the creosote in proportions of one part to fourteen parts of olive oil, which has been washed and thoroughly sterilized.

The author finds that purified creosote may be used in even a higher proportion, as one part to ten.

Transfusion of Tissue Juices.— The announcement made three years ago by Prof. Brown-Sequard, of the remarkable effects of introducing into the system the sterilized juice of the genital glands, created a mixture of amusement and serious interest on the part of the profession, while a considerable excitement was created by newspapers in the minds of the general public. Failure of the method to accomplish all that was expected of it

soon brought it into disrepute, and today it is probably by the majority of physicians looked upon with contempt. Nevertheless, M. Brown-Sequard has maintained the correctness of his observations and views, and has continued his experiments, and recently M. Paul has communicated to the Academy of Medicine of the Society of Therapeutics, Paris, observations concerning the effects of the injection of the juice obtained from nerve tissues, particularly the brain, which are analogous to those obtained by Brown-Sequard. The operation is termed by M. Paul, "nervous transfusion." M. Paul was led to experiment in this direction by the idea that he would be able to obtain the same results with brain juice that M. Brown-Sequard obtained with testicle juice. M. Paul repeated his experiments for more than a year before announcing his results. In his report of his experiments he claims complete recovery in five cases of neurasthenia, also complete recovery in one case of tabes combined with neurasthenia. In the last case referred to, the patient was 25 years of age, suffered from lumbar weakness, difficulty in walking, and complete loss of intellectual vigor. Ten injections of 2 to 5 c.c. of cerebral juice completely restored the patient's energies and dissipated his pain.

In one case of locomotor ataxia — a man forty years of age — the pain entirely disappeared, and ability to use the limbs with ease and perfect co-ordination was restored. In two other cases of locomotor ataxia the patients were very greatly improved, the pain being diminished and the in-co-ordination movements greatly lessened. The number of injections in the case of neurasthenia varied from one to twelve, and in the cases of locomotor ataxia from forty to forty-six. The profession will await with interest the results of further observations.

A New Boric Preparation, — Boro-borax. — This preparation, discovered by M. Jaenicke, results from a mixture of equal parts of borax and boric acid in boiling water.

The antiseptic and therapeutic properties of this mixture resemble those of boric acid, but it has a neutral reaction, is much more soluble, dissolving at ordinary temperature 16 parts of boro-borax for 100 of water; at 100°, 30 parts dissolve in 100 of water; at boiling temperature, water dissolves 70 per cent of the substance.

Boro-borax is readily made by mixing together in boiling water equal parts of borax and boric acid. On cooling, the greater part of the substance crystallizes out.

Effects of Electrical Currents of High Potential. — M. de Arsonval (*La Semaine Medicale* of recent date, reports the results of comparative experiments for the purpose of determining the physiological effects of the different methods of electrization as follows: —

"1. The static bath increases the consumption of oxygen, and the production of carbon-dioxide.

"2. Nothing analogous has been observed with continuous currents.

"3. The amount of respiratory gaseous exchanges is obtained without muscular contraction and without painful phenomena, with alternate currents."

As to the physiological effects of rapidly alternating currents, the following conclusion has been reached: "The danger presented by these currents is less in proportion as the frequency of alternation is great; with alternations in the neighborhood of a million per second, currents may be passed through the body without danger, which would produce in the individual the effect of a thunderbolt if applied in a dose one hundredth part as great, but with slow alternations."

These conclusions seem to agree with those of M. Nikola Tesla, a young Italian electrician, who has recently been making some very remarkable and interesting experiments at the Royal Institution in England. M. Tesla was the inventor of the first alternate current electric motor. He has invented a dynamo which supplies a current alternating 20 times per second. By the aid of this current, he produces an electrical light in a vacuum tube without the aid of a filament, and by attaching to the poles of his generator two sheets of tin foil, one overhead and the other on a table, the space between becomes electrified, and a long vacuum tube waved about in the space between the sheets of tin foil glows in the darkness like a flaming sword. The inventor proposes to run an entire room electrically

by plates in the ceiling and floor, so that vacuum bulbs placed anywhere in the room will yield light.

But the fact of especial interest to physiologists is the observation that these currents of extremely high potential seem to be without effect upon the human body. To illustrate this, an experimenter took an iron bar in one hand and a vacuum tube in the other, then connecting the iron bar with a terminal which was capable of emitting sparks several inches long, the vacuum tube was made to glow brilliantly, although the body of the experimenter was wholly unaffected. The statement was made that if the force of current had been $\frac{1}{500}$ part that of the current actually employed, it would have produced instant death.

It would seem that we have only just begun to get a glimpse of the marvelous properties of this wonderful agent.

Hæmostatic Gauze. — For 200 parts by weight of gauze, make a solution consisting of glycerine, 15 parts; water, 200 parts; alcohol, 200 parts; tinct. perchloride of iron, 150 parts. Allow the gauze to absorb the solution. Press until one third the solution has been expressed, then dry without exposure to light.

Neutralizing Snake Venom. — Dr. Albert Calmette, in studying the venom of the cobra, one of the most poisonous serpents known, found a method of neutralizing it in the system of bitten subjects. In a report made in the *Annales de l'Institut Pasteur*, Dr. Calmette states that chloride of gold, in slight quantities even, neutralizes the toxicity of the venom. It is known that most of the physiological alkaloids of animal tissues have the property to form crystallizable salts with the chloride of platinum and chloride of gold. Dr. Calmette found that chloride of platinum in a one-per-cent solution makes a gelatinous precipitate which introduced under the skin is quickly absorbed, and kills the animal as promptly as the pure venom. The chloride of gold, on the contrary, gives a precipitate of similar aspect, but insoluble. The mixture of this substance, even in a very feeble preparation with the snake venom deprives the latter of its poisoning property. There occurs a reaction comparable to that of the albumen of egg in the presence of mercuric salts. Considerable quantities can be injected under the skin, in the muscles, in the serous cavities, and in the peritoneum without the least accident. The tissues freshly impregnated with a feeble solution of chloride of gold, are rendered incapable of absorbing the venom. The author made numerous experiments with animals, which sustain this conclusion.

The Goat as a Source of Vaccine. — The experiments which have recently been made with the injection of the blood of the goat in the treatment of tuberculosis have given rise to the suggestion that this animal, which seems to enjoy absolute immunity against tuberculosis, might prove to be a better source of vaccine than the calf, which is well known to be subject to tubercular disease.

It has long been known to veterinary surgeons that the udder of the cow is a frequent seat of tuberculosis. In such cases the calf would be very certain to become affected, and tuberculosis has been not infrequently observed in calves. It is consequently possible that tubercular infection might occur through vaccination, although such cases must be exceedingly rare, and if the vaccine is produced with proper aseptic precautions, including a careful examination of the animal itself before vaccination, it would seem that infection from this source might be considered as scarcely possible. Nevertheless, research and experiment in every direction looking toward the conservation of human life is to be welcomed and encouraged.

Laveran's Parasites in Intermittent Fever. — At a recent meeting of the Society of Internal Medicine, at Berlin, M. Bein presented an interesting case in which Laveran's corpuscles had been found in the blood of a newborn infant whose mother was confined during a paroxysm of intermittent fever. The parasites were found in the blood of the mother also.

M. Bein makes the following summary of facts respecting these parasites, or plasmodias: —

"These plasmodias appear in the first stage under the form of small round corpuscles eight to ten times smaller than red globules. They are transparent and

mobile. From the periphery of these corpuscles very active filaments are thrown off. In the operation of growth, the parasites seize upon the coloring matter of the red corpuscle in which they are contained.

"Later, there is observed a true sporelation within the interior of the parasites.

"It is at the moment when this sporelation occurs that the initial chill of the paroxysm makes its appearance.

"By an examination of the blood, then, we are able to say at what hour the next paroxysm of fever will appear, and according to the number of parasites contained in the blood, one may say whether the paroxysm will be grave or benign.

"To explain the different types of the fever,— quotidian, tertian, and quartan, it may be supposed that the parasites belong to several generations which are each separately involved, and only occasionally give rise to fever when their evolution is completed.

"Under the influence of sulphate of quinine the parasites disappear. Methyl blue gives also a good result."

In the discussion of this paper M. P. Goodman stated that he had found the parasites present in only a single case.

Race Deterioration. — Four years ago, a committee was formed by the psychological section of the British Medical Association, to make an extended inquiry into the physical and mental condition of school children. The committee has been industriously engaged in their work since its appointment, and have examined over 50,000 school children, of whom nearly 27,000 were boys, and 23,000 girls. From a report recently published, it appears that in this number there were found over 3600 boys, and over 2200 girls, 5800 in all, who presented palpable defects in development. Doubtless there were many more than this, but the method employed permitted the inclusion of only such cases as presented very obvious and visible physical defects. It thus appears that nearly 12 per cent, or approximately one eighth of the entire number of children examined were found to be physically defective; and when it is considered that a large number of these children have not yet reached an age when inherent morbid tendencies or deficiencies would be so obviously apparent as at a later period, it must be conceded that the showing is a bad one.

It was also particularly noted that the larger proportion of defectives was found among the children of the upper classes, from which it would appear that deficiency of food and exposure cannot be held responsible for this frightful downward tendency, but that it must be attributed to some other great underlying cause. Just what this is, has not been pointed out by the committee, and we have no means of knowing whether it has formed a definite opinion upon this point. It may be suggested, however, that the multiplication of luxuries, excesses at the table, and in various other directions, and especially the neglect of physical training or muscular exercise must be held largely responsible for this degenerative tendency.

Sputum as a Diagnostic Sign in Certain Diseases.— It is not only in tuberculosis that sputum may be analyzed properly from a diagnostic standpoint; indeed, there are quite a number of maladies in which the microscope applied to the study of the sputum may be of very great and very practical value. Dr. Morris thus sums up the most important observations in sputum in some affections, in the *Times and Register*: —

"In phthisis, we have nummular sputum; looks like coin; floats in a clear liquid.

"In measles we have nummular sputum, which floats in an opaque liquid.

"In bronchiectasis there is stinking sputum; also in fibroid phthisis there is stinking sputum.

"In cancer of the lung, we have sputum that looks like currant jelly.

"In pneumonia, we have rusty colored sputum.

"In œdema of the lung, the expectoration is serous.

"Where we have pneumonia terminating in gangrene of the lungs, the sputum is exceedingly fetid, greenish or brownish.

"The sputum of chronic bronchitis, when associated with disease of the heart, looks like the white of egg mixed with water, and may amount to a quart or half gallon in twenty-four hours.

"The sputum of chronic bronchitis when not complicated is large, broad, and irregular, and is greenish or yellowish."

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

Tubercle Bacilli in Semen.— Foa, an Italian observer, reports a discovery in a case of disseminated tuberculosis, of tubercle bacilli in semen obtained from the *vesiculæ seminales*.

Action of Dog Serum on Rabies Virus.— According to the *British Medical Journal*, Evangeliste, an Italian bacteriologist, has discovered that the germicidal properties of bacteria prophesied by Nuttall years ago, and demonstrated by Buchner and other recent observers, is active, as regards the virus rabies. It is true that no positive discoveries have yet been made respecting the bacteria by which this virus is produced, although there can be no doubt that the vital bacterial element is present in this, as in other similar poisons. The experiment showed that the virus was invariably attenuated when exposed to the action of dog serum for more than 22 hours, and was finally destroyed. Pigeons' blood was found more active than dog serum.

Nutritive Processes of Microbes.— M. Charrin reports in *La Semaine Medicale*, the results of some interesting experiments which he has conducted for the purpose of determining something of the nutritive process of microbes. He prepared a culture fluid which contained a solution of phosphoric acid, phosphate of soda, carbonate of potash, chloride of calcium, and sulphate of magnesia. To this he added known quantities of crystallized asparagin, and then introduced a microbe which produces a greenish-blue coloring matter. By means of the coloring matter produced, the experimenter was able to follow from hour to hour the progress of the assimilation of the asparagin.

By careful chemical analyses it was determined that 91 per cent of the asparagin was eliminated as ammonia by hydration, and through the vital action of the germ itself; 4.6 per cent was organized into the bodies of the bacteria, and 4.04 per cent entered into the composition with the specific principles produced.

The conclusions which the author derives from these experiments are that the pathogenic microbes experimented with are nourished in essentially the same way as animals, so that the pathological effects produced by microbes must not be studied solely with reference to the mechanical or chemical effects produced; but the fact of the consumption of nutrient elements of the system, thus inducing a condition of starvation, must also be considered.

Infectious Maladies Modified by Antagonistic Microbes.— Dr. Stanley M. Ward, of Scranton, Pa., in the Pittsburg *Medical Review* of March, publishes a very interesting article with the history of a case, tending to sustain the view that certain infectious maladies may be modified by the action of antagonistic microbes, living simultaneously or successively in an individual. He points to the fact that the bacillus of tetanus acts less potently, if at all, in the presence of suppurative micro-organisms; that the fluorescent bacillus of Flügge antagonizes the organism of typhoid fever and pneumonia, and retards the growth of the cholera spirilla. Other authors claim that the bacillus of anthrax is destroyed in contact with either the diplococcus of pneumonia, the staphylococcus aureus, or the streptococcus erysipelas. He also points out that almost a parallel exists between these facts and the result of Jennerian vaccination. In the case reported by Dr. Ward, it seems that membranous croup was antagonized in its development by the action of varicella, and he points to the possibility of preventing the dreaded manifestation of membranous croup by the introduction of an antagonistic virus. The point is worthy of consideration.

Mechanism of the Action of Pathogenous Microbes.— Many hypotheses exist as to the method of action of disease germs in the econony. It seems that on the one hand there is a real cellular fight between microbes and body cells, during which poisonous matters are secreted on both sides as a means of defense; on the other there is a splitting up of the substances composing the cells, tissues, and humors.

Role of Oxygen in the Production of Ptomaines.—The action of oxygen in the generation of ptomaines in putrefaction is very manifest. Brieger has shown that it increases the quantity in a marked degree. Possibly this same action exerts an important influence in septic maladies in which such toxines play a fatal role.

A Remarkable New Skin Disease.—Dr. Savill reports a peculiar epidemic of skin disease among the aged population of some London workhouses. It is characterized by desquamation and exfoliation of large patches of epidermis, so extensive sometimes as to produce a "complete cast of hand or foot." A diplococcus has been discovered in connection with the lesions, but it has not yet been ascertained whether it is a new pathogenic germ or not.

A New Antiseptic Combination.—Dr. J. de Christmas, in a recent *Annales de l' Institut Pasteur*, reports several experiments prosecuted by him with the view of discovering a safe and effective antiseptic. Among the combinations tested is the following which he has termed "phenosalyl," and which though comparatively safe is next to bi-chloride of mercury as a microbicide: phenic acid, 9 grams; salicylic acid, 1 gram; lactic acid, 2 grams; menthol, .1 centigram.

This mixture is prepared by heating the three acids until liquefaction; it is very soluble in glycerine. It is soluble in water in the proportion of 4 per cent. [Let some enterprising proprietary medicine company patent this or secure a copyrighted trade mark, and bring to the physicians a brand new antiseptic "for the doctor only!" It would not be the first of the wonderful *new* remedies thus evolved in our free country — too free and loose in matters of medical science.—Ed.]

Microbic Action in the Digestion of Cellulose.—The mechanism of the digestion of cellulose has always been a puzzling question to physiologists. Scarcely anything but hypotheses have been advanced. M. H. Brown, in a report published in the *Journal of the Chem. Soc.*, April, 1892, gives an interesting account of his discovery that the animal does not furnish the diastase to set free the starch inclosed in grains swallowed whole by gramnivorous animals, but the grains themselves furnish it. It seems that the animal only supplies the necessary temperature and moisture, and that in this condition the diastase existing in the grain dissolves the cellulose and liberates the starch, which then is appropriated as food by the animal economy. However, as Duclaux has well proven, in ruminants at least, there is another factor in the digestion of cellulose; it is the action of microbes. Though these organisms may not be necessary for the digestion of grains, the long stay of aliments in the paunch exposes them to undoubted microbic influences. These germs belong to the complex group of "amylobacter" described by Van Trieghem.

How the Bacillus Coli Communis Invades the Organism.—Wm. H. Welch says that he has found the colon microbe in one or more organs of the body in thirty-three autopsies out of about two hundred. His opinion, well sustained by observations, is that these organisms invade the circulation and thence the organs by lesions of the mucous membranes of the intestines, such as hemorrhage, ulceration, perforation, catarrhal and diphtheritic inflammation, strangulation, cancer, traumatic injury, and intestinal suture.

"The bacteria were found in the blood, lungs, spleen, kidneys, peritoneum, bile-ducts, gall-bladder, liver, lymphatic glands, testicles, tonsils, brain, and wounds." They were more frequently found in the lungs and kidneys.

It is of interest to realize that in typhoid fever this germ, which resembles the typhoid bacillus very closely, may be mistaken for the latter when the two are mingled in some organ or other. In such cases the colon bacilli enter the tissues by the lesions produced by typhoid fever in the alimentary canal. It is well known that M. Roux, of the *Institut Pasteur*, teaches that the colon bacillus may be transformed into the typhoid bacillus. Welch's excellent work declares very forcibly against this unwarranted assertion.

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AN original article on Immunity, by Dr. Metchnikoff, the founder of the theory of Phagocytosis, begins with this number. It should have appeared simultaneously in the *Annales de l'Institut Pasteur*, Paris, France, and in the BACTERIOLOGICAL WORLD AND MODERN MEDICINE for May, but miscarried in the mails, and was received too late to do better than begin its publication this month.

SECOND MEETING OF THE AMERICAN MEDICAL TEMPERANCE ASSOCIATION.

THE second meeting of the American Medical Temperance Association was held at Detroit on Thursday evening, June 9, 1892, during the meeting of the American Medical Association. It is to be regretted that every member of the American Medical Association was not present to hear the vigorous utterances of the veteran pioneer in medical organization, Dr. N. S. Davis, the President of the American Medical Temperance Association, whose annual address presented the most succinct and cogent résumé of physiological facts relating to the effects of alcohol upon the human system, to which we have ever listened. The audience, although not so large as it should have been, included a considerable number of prominent medical gentlemen, and was a most appreciative one, frequently applauding the timely hits made by the President against the loose practices of the profession, in prescribing alcohol for their patients under the most diverse and varied circumstances, and without any proper consideration of the physiological effects of the drug.

Among the popular errors which Dr. Davis especially condemns, is the notion that alcohol is a stimulant. Dr. Davis regards alcohol as a narcotic and an anæsthetic in all doses and under all circumstances, and quotes experiments by Reichert and other eminent physiologists, made upon the heart of the frog, and the muscular tissues of other animals, which seem abundantly to support his position upon this question. Dr. Davis makes no use of alcohol, even as a medicine, and has maintained his present practice in this respect for more than forty years, his experiments many years ago having led him to his present views respecting the influence of this drug upon the system.

While fully agreeing with Dr. Davis respecting the ultimate effects of alcohol upon the system, we have for some years been of the opinion that a very slight and fleeting stimulant effect is derived from the use of the drug when taken by the stomach, owing to its irritating effects upon this organ. Alcohol, if applied to a raw surface produces a smarting sensation; if applied to the mucous membrane of the eye, and even when taken in the mouth in a pure state, it has a similar effect. This transient irritating effect may exert a temporary stimulating influence upon the heart and other vital organs, although as soon as the drug has been absorbed so that it comes in contact with the nerve-centers and other structures, its true effects, which are those of a narcotic, become speedily apparent.

Interesting papers by Dr. Quimby of Jersey City, and Dr. Crothers of Connecticut, the Secretary of the Association, followed the address of the President, and were succeeded by a spirited and interesting discussion of the points presented in the papers. A committee was

appointed to prepare a report upon the statistics of non-alcoholic medical treatment, and a member of the Association was requested to prepare, for the next meeting, a paper showing the injurious effects of tobacco upon the human system. It was also voted that the President's address should be printed in pamphlet form for wide distribution.

The meeting was, upon the whole, a very interesting and enthusiastic one, and all in attendance were sorry that but a single session could be held. Any person wishing to become a member of this Association can do so by signing the following statement and sending the same with one dollar to the Secretary of the Association, Dr. T. D. Crothers, Hartford, Conn. : —

Being an abstainer from all intoxicating liquors as beverages, I desire to become a member of the American Medical Temperance Association, and am willing to comply with the requirements of its By-Laws.

.....Name.
.....Address.
.....Date.

Any one who has studied the subject of temperance from a medical standpoint will agree with the statement that the medical profession is largely responsible for the erroneous opinions which prevail among the people respecting the use of alcohol. When a physican recommends beer or whiskey for one who is weak and convalescing from a fever, the patient cannot be easily made to see that alcohol is not equally good for him when weak as the result of the loss of a night's sleep or an extra hard day's work, or when the emergencies of business impose extra burdens upon him. If alcohol will give him more strength in one instance, it will assist him equally in each of the others. If the people can be made to understand that alcohol has no power to impart strength, but that it is simply a deceiver, producing the appearance of strength without any real increase of vigor, a long step will be taken in the direction of the suppression of inebriety and the hundred disorders of the brain, nerves, stomach, and liver, which follow in the wake of the drink habit. J. H. K.

THE RELATION OF PUTREFACTION TO DISEASE PHENOMENA IN LIVE TISSUES.

VERY properly, the physician sometimes illustrates the action of certain bacteria in tissues by comparison with the decomposition of meat and other substances. However, there is an important difference which, in our study of diseases, it is necessary to note. This difference consists of two things; *first*, the life resistance exerted by the live cells in disease, which is entirely absent in putrefaction; *second*, the successive microbe invasions in putrefaction, each with a more or less marked action, sometimes antagonizing, sometimes helping each other, — phenomena usually absent or somewhat limited in diseases essentially bacterial in *their origin.*

The analogy between putrefactive phenomena and the forms of fermentation that take place in such maladies as anthrax or septicæmia, for example, is reduced to the *microscopic appearance* of the blood and tissues, and to the fact that there occurs in both cases a sort of partial transformation of a similar order. But in special diseases, the specific poisonous ptomaines generated in the process do not exceed, so far as known, one each ; in faction there may be several kinds produced. Again, in the maladies named, the tissue cells react on the microbes ; they fight for their life, and sometimes of their own accord limit the action of their enemies, while in putrefaction there is no fight between the dead cells attacked and the invaders. The latter cause a complete annihilation of their hosts, and transform them fully. In studying the possible relationship of the two phenomena we must confess to an affirmative conclusion to this

proposition, but at the same time we should remember always that putrefaction implies that death preceded the microbic destruction. When disease occurs, putrefaction may take place locally, in certain dead parts, and the rest of the body may still live, but in all cases death first occurs in anything in which true putrefaction begins.

Those therefore, who insist that septicæmia and putrefaction are identical, are not exactly correct. The two processes are of the same order, but not identical, nor are they due to essentially similar microbes. P. P.

A MAGAZINE'S PLEA FOR CLAIRVOYANTS.

In the June number of the *Arena* appears an anonymous article in defense of "the born doctor divinely commissioned," etc., entitled "Confessions. — I. The Physician." The points that the writer attempts to make, are : —

1. That the doctor is born, not made ; that the diagnostic power (Dr. Buchanan's psychometry) is an "innate faculty," as "music, poetry, marksmanship, and the trailing power of the bloodhound."

2. That medical colleges, medical societies, and medical journals are responsible for incompetent doctors, and that medical education is not indispensable to the man born with the so-called "sixth sense" or "diagnostic genius."

3. That creeds in the medical ranks have codes of ethics based on monopolistic principles.

4. That a "born doctor," no matter how ignorant of medical science he may be, should be paid for his "valuable information." (This is the milk in the cocoanut).

In answering the writer (who diagnoses "by intuition," and modestly points to his own genius and infallibility in this accomplishment), we will endeavor to show, chiefly, the fallacy of the fundamental basis upon which he tries to build his case.

In the first place the author assumes that there is a special sense in nature, which only a few human beings possess, — a so-called "sixth sense" or "diagnostic faculty" or "psychometry." If this be true, he is right in many of his conclusions ; if not, he is wrong in all the deductions made. We will assert at once that he is mistaken in his premises. No man possesses a special, natural, innate faculty of diagnosing disease other than the perceptive intellectual powers rooted in the organism and common to all men. Of course it is true that these vary very greatly in human beings, but it is only in the matter of degree, and not a difference of senses.

The variability that prevails among physicians in their diagnostic power depends upon several conditions, — variable intellect, variable penetrating power, variable discerning faculties, variable perceptive capacity, variable judgment, etc., and last but not least, upon variable medical knowledge and experience. The greatest experts as diagnosticians, do not thereby indicate to outsiders the existence in them of a rare special sense, in the physiological and psychological manner implied in the *Arena*, but merely a greater development of the natural powers which contribute to the faculty of diagnosing disease when the individual is *properly equipped.*

Suppose it were true that some men are born diagnosticians ; granting for the sake of argument that some have special intuitive power — a *clairvoyant faculty* of diagnosis, in other words — what could they do to relieve suffering humanity? — They could only locate the disease ; at the best, they could only indicate the spot affected. Neither the author of the clairvoyants' defense, nor Dr. Buchanan, whom he quotes and apparently follows, dare assert that this "divine" psychometry carries with it a knowledge of pathology. If it does not, of what real good is it independently ?

Does it not become imperative to the supposed possessor of this gift, that he shall study medicine, understand the natural condition of the organism, and the alterations which take place in disease? Suppose a "sixth sense" "born doctor" is presented a case of nervous affection: he may say that the disease is in the brain; he may locate even the particular spot affected; but what good will this do, even if he knows *materia medica* thoroughly? He cannot apply the remedy safely without understanding the organic and functional nature of the changes indicated by the symptom, and of the actions and possibilities of the remedies to be prescribed. What benefit will it be to know that a fatal bullet is located in a certain part of the abdominal cavity, if one does not know how to remove it? The defender of psychometry places his special "sixth sense" on a level with "music, poetry, marksmanship, and the trailing faculty of the bloodhound." Does he mean that each of these are so many more special, independent senses? It certainly looks that way. If so, he can easily multiply the special senses to hundreds. Does he not see any difference between an acquired skill and a natural attribute? — the acquired marksmanship of a rifleman, and the instinctive trailing faculty of the bloodhound, for instance? This confusion in the writer's mind has the advantage of showing clearly to his readers that he is ignorant of the fundamental principles of psychology, which are necessary in the discussion of such questions; and furthermore, that his "special diagnostic sense" is imaginary. For, to compare it with music, which cannot be evolved without training and study, even in the most musically inclined, is to acknowledge that the "innate diagnostic" power must also be trained by schooling, though he denies the necessity of it.

Science flatly denies the existence of this wonderful faculty of "intuitive diagnosis." Neither physiology nor psychology supports the idea. It is a notion born long ago of ignorance, exaggerated self-confidence and conceit, not a scientific discovery. For the unscrupulous charlatan, it forms the basis of his pretext, to filch fees from the pockets of sufferers; and for the honest believer as the writer mentioned seems to be, it is a veil blinding his intellect, and smothering his conscience. The first point of the author is not made.

"But," he may retort, "the sixth sense is only capable of diagnosing, not suggesting or applying remedies. "Very well then, we will answer: The sixth-sense man must go to the college which the writer denounces, and learn from science sufficiently to use this so-called special faculty (which is only the natural intelligence, perspicacity, etc.), properly in the practice of medicine. So the attempt to prove that medical colleges are harmful or valueless, is a ridiculous effort, aborted by the writer's own logic (?). Common sense readily suggests this. We admit several shortcomings in medical colleges, and in the methods of teaching medicine. We know that they are far from being what they ought to be; that there is a tendency to run them for financial benefit only,—in fact we know that many are run for nothing else than the aggrandizement and enrichment of the teachers. But still, we know that the majority of doctors trained in such institutions and by such methods, are incomparably superior to the most adroit "intuitive" born doctor.

In the third place, the confessing doctor endeavors to establish that the stern code of ethics in the medical profession, is merely a dodge instituted and ruled by monopolistic principles to reap a rich harvest in the practice of medicine. This is the most puerile assertion of the whole article, when all know that one essential feature of medical ethics is directed toward the prevention of all kinds of mo-

nopoly, such for example as the patenting of formulas, instruments, etc., and furthermore, to prevent true physicians from degrading themselves into becoming tradesmen for pelf, instead of remaining true soldiers in the cause of humanity, for a just compensation. It is unfortunate that mankind should be so perverted that we cannot depend upon physicians without such protection against adventurers which may be in their ranks; but the very fact that men are found in this scientific age, who will assert without a scintilla of proof (admitting their inability to explain) the existence of an intuitive (clairvoyant) faculty to diagnose disease, is a good evidence that the code, as a regulation, is in the right direction.

Should the "born doctor" be paid for his "valuable information"? The writer under discussion answers, "Yes." There being no such thing as a born doctor in the sense implied, the question would need no answer, were there not such things as *pretenders*, who sail under this assumption, and others who conscientiously believe themselves the possessors of some kind of natural, undefinable faculty to practice medicine.

This circumstance forces us to reply. Science, common sense, and experience absolutely prove the non-existence of the "sixth sense" in question, consequently the man who claims to possess it, and who, under this notion, demands or accepts fees for "valuable information," demands or accepts money in payment for something which he has never given. It is therefore illegal, unjust.

Granting again, for the sake of argument, that this "sixth sense," the born power to diagnose disease, does exist, it cannot at the same time infuse knowledge of botany, chemistry, physics, physiology, histology, anatomy, pathology, bacteriology, therapeutics, etc., etc., all of which are essential to qualify one to practice medicine, even *after* the diagnosis is made, whether one does or does not possess "a peculiar intuitive perception which cannot be explained or taught." So, even when a doctor believes himself thus "divinely commissioned," he is not justified in receiving fees as a medical practitioner if he has not studied into the science and art of medicine, because he does not possess the qualifications that mankind are entitled to, nor is he capable of rendering the measure of service that common sense, science, and practical medical education can and do render, and that justice demands.

Furthermore, the preaching, teaching, and advertising of the "intuitive doctor," the "born doctor," the "divinely commissioned" doctor, are like the claims of the "seventh child," and the ignorant "Christian Scientist" deceptions, practiced wilfully or ignorantly on a credulous public. Surely it is not right that the deceived should pay (willingly or unwillingly) for the deception.

Before closing, we must commend the views of the author in some other points: First, we believe with him, that Greek and Latin are not essential to success in medicine. We know that many highly educated men are failures in the practice of this art and science; and we believe with the author, too, that some system of weeding should be practiced among those entering the ranks. Education in the classics, or in the various departments of college and university curriculums is not a guaranty of fitness to practice medicine. Integrity, common sense, charity, sympathy, intelligence, sound judgment, and moral principles should be considered of primary importance. Colleges ought not to be the sole judges of the adaptedness and qualifications of doctors. If the right kind of board of examiners passed upon the fitness of candidates before being allowed to practice in any State, it would improve the standard of physicians. It is true that a vast army of medical men are unfit, by nature or by

education, or by both disqualifications, to practice medicine.

There is but one rational basis upon which to practice medicine; and whatever claim medical creeds may make, none of them are right if they ignore the principles which form this basis. From these principles it is clear that all attempts to cure disease can only be made in the form of assistance to nature in her own efforts to restore health. No man can, by any means whatever, cure any disease simply by art or science. He can at best only supply means by which physiological action may be aided in the natural work of restoration. Consequently, no system of medicine is right that does not base its practice in all pathological conditions, on a broad knowledge of physiology (which cannot be learned by intuition). The truest and best physician is the man of common sense, sound judgment, integrity, morality, and sympathy, who has acquired a scientific and practical knowledge in all the departments of medicine, and does not hesitate to use physiological means, and anything rational, to relieve suffering, and aid in effecting a cure. P. P.

BIOLOGY IN THE STUDY OF CHARACTER.

Accepting as true the old metaphysical idea that personality is simply lodged in the individual, and is subject at all times, in case of sanity, to his control and will, the great majority fail to see that biology has any importance in reference to man's character, other than the pathological conditions which it may reveal in cases of insanity; even this is granted reluctantly. If it were true that character is such a special supernatural endowment,— an attribute thus dwelling in man, but not essentially a part of man's organization,— then biology could help us little in the study of man's characteristics. But in the judgment of modern naturalists, at least those who have studied life in the little as well as in the large (microbes and pluri-cellular organisms), there is no room to doubt but that character is rooted in the organic substance, and depends upon it for its existence; it does not come to man as a separate gift at birth, but it grows from the very moment of conception, and is molded largely as the body develops before and after birth. Indeed, we may safely say that character begins before conception, as all-powerful influences are transmitted through the male and female cells uniting to form the first cells of the child's body.

Personality, then, is rooted in the very cells of our tissues, and the proper balancing of these must have a great bearing upon the proper balancing of the character. Morality springs from living tissues, like other integral parts of man's characteristics. Purity and impurity, sobriety and inebriety, rest on certain natural inherited or acquired organic conditions by which the natural appetites remain natural or become depraved, and the power of control remains intact or becomes decreased under exciting causes, such as environment, nutrition, stimulation, etc., etc. Sometimes such exciting causes, stimulation by liquor drinking, for example, contribute to the alteration of the cells, and become thereby a predisposing influence besides.

Biology, then, is a proper means of investigating man's personality, and the diseases thereof. It is a most important factor. In the first place, it establishes the physical relationship of all animals and men. 2. It discloses the influences of nutrition on cell-character. 3. It reveals some characteristics of the most minute individuals, thus supplying means of comparative study of the most hidden activities and properties of different organisms in the animal kingdom.

Biology is the most penetrating, the most discerning of all direct methods of analysis of cell-life. Logical deductions bearing on man's personality can be made

from comparative studies and biological revelations, which the uninitiated never dream of.

In disclosing the influence of food on cell-life and activity, biology gives positive evidence that alterations may be produced in the faculties of the cells, and the character of the whole organism that they form, singly or co-operatively. It shows clearly that an organism may be rendered passionate, and that all its natural appetites may be decreased, destroyed, or increased to various degrees of intensity,—even to such perverseness that some of them will appear as purely acquired vices. No more reliable evidence is given of this fact, than by the close study of microbic life. P. P.

AN INQUIRY INTO SYPHILITIC AUTO-INTOXICATION.

AMONG the original articles of this number, appears by permission, a revised article by Dr. A. H. Ohman-Dumesnil, entitled "An Inquiry into Syphilitic Auto-intoxication." The article is expected to appear this month in another medical journal of local circulation. Notwithstanding this fact, we believe it of sufficient interest to give it place in our columns as original matter.

REVIEWS.

The Diseases of Personality.— By Th. Ribot, Professor of Comparative and Experimental Psychology in the College of France. Translated into English and published by the Open Court Publishing Co., Chicago, Ill.

This is a delightful book, discussing disorders of organic matter, the emotions and the intellect, and treating of the dissolution of personality. The work is based on comparative psychological inquiries made by the learned author. It demonstrates the natural origin of characteristics and how they become diseased. It is an interesting, instructive, and reliable volume.

Dictionary of Treatment.— By Wm. Whitla, M. D. It is needless to say that this "Therapeutic Index, including medical and surgical therapeutics" is up-to date. The author's name is a guarantee of thoroughness. The book contains some 900 pages, in which the best treatments generally used are tersely and plainly set forth in brief words. Arranged as it is, in alphabetical order, it is very handy for reference. We can recommend it to our readers, as thoroughly reliable, and very practical and useful. The young practitioner will find it of special interest. Lea Bros. and Co., Publishers, Philadelphia.

Insomnia and Hypnotics.— By Germain Sèe, M. D. Translated by E. P. Hurd, M. D. George Davis, Detroit, Mich., Publisher.

This is another of the very many useful, practical and brief little books of the Davis "Leisure Library" series. The author's name is a guarantee of reliablity, and the translation does him justice. The physiology of sleep, the subject of Insomnia and Hypnotics, treated in this volume, are questions of great interest which receive too little attention. Every doctor should read the book. Price 25 cents.

Are Inebriates Curable? — By T. D. Crothers, M. D., Hartford, Conn. A paper read before the English Society for the Study of Inebriety, London, Jan. 24, 1892.

This is a thorough and important article on the subject of inebriety. Dr. Crothers is undoubtedly one of the best qualified men in the country to speak authoritatively on this question. He is thoroughly satisfied that inebriety can be, and will in time be largely controlled by the medical profession and by legislative acts. This is a little pamphlet which every doctor ought to peruse attentively.



WHERE TO SPEND THE SUMMER

AT this Season of the Year, thousands of Invalids are seriously considering the question,—

Where Can I Spend the Months of July and August, and part of September, with the Greatest Profit and Satisfaction?

THE ANSWER to this question depends on what the individual wishes to accomplish by a summer vacation. If change and recreation only are desired, these can be found in a thousand places—at health and other resorts which abound in almost every State in the Union, none of which, however, excel the delightful resorts of northern Michigan.

If, in addition to rest and recuperation, the invalid needs a careful study of his diseased conditions, and an intelligent regulation of diet, exercise, and all other health conditions,—in other words, scientific health culture, efficiently carried out by the aid of the best known medical means and appliances, thoroughly trained nurses and attendants, and competent physicians,—then the choice between the most desirable places becomes very much restricted. - There are certainly few institutions in this country where the needs and desires of an earnest health-seeking invalid can

be satisfactorily met. Such places can be counted on the fingers of one hand, and are, perhaps, little known because of the fact that the managers of such institutions are conducting them in a scientific, and in some instances a philanthropic spirit, and consequently do not employ as a means of winning patronage, the emblazoned advertisements, the truth-sacrificing circulars, and other advertising methods commonly resorted to by the proprietors of mineral springs establishments, bogus sanitariums, and other so-called "health institutions" and quasi-medical establishments, with which the country abounds.

The advertisements of these establishments do not appear in public prints or popular magazines because such advertising is closely akin to quackery, and brings those who employ it into bad company.

The managers of the Sanitarium at Battle Creek, Michigan, many years ago undertook to organize a thoroughly scientific institution which would represent rational medicine in its most advanced form, and would be exactly what it professed to be — an institution where patients are honestly and fairly dealt with, treated at reasonable rates, given kind attention and comfort, and opportunity for the recovery of health under the most favorable conditions. The majority of patients treated in this institution are sent to it by physicians who by personal acquaintance, or through the reports of their patients, have become thoroughly familiar with the character of the institution and its management.

BRIEF DESCRIPTION OF THE SANITARIUM.

BATTLE CREEK, one of the most beautiful and prosperous cities of Michigan, is centrally located in the salubrious Peninsular State. Its population is 20,000, while its death rate is but seven per thousand. Battle Creek is situated on two great thoroughfares of railway travel between the East and the West, being at the junction of the Grand Trunk and the Michigan Central lines; and two other railways make it easy of access from the South.

The city has an electric railway and is lighted by electric lights. A great number of pleasant drives are afforded by its well-kept and shaded streets.

The Buildings are lighted by a 700-light plant, Edison incandescent system.

Safety Hydraulic Elevators. Outside stairways for fire escapes accessible from every window.

The Institution affords facilities for baths of every description: Turkish, Russian, vapor, electric, water baths of all kinds, and the electric light bath. Independent accommodations for ladies and gentlemen, sufficient for 80 persons at one time. More than 800 feet of glass for sun-baths.

A General Parlor, 40 x 50 feet, is luxuriously furnished with Dhagistan rugs, easy chairs, etc. The Dining-Room has a seating capacity of 400, is beautifully lighted and ventilated, and always cheerful. No kitchen smells. Cuisine unsurpassed; table service excellent. Everything an invalid needs, and special dietaries prepared as directed.



VIEW OF GOGUAC LAKE FROM SANITARIUM LAKESIDE GROUNDS.

The Gymnasium, 85 x 45 feet, is supplied with every appliance for exercise, and furnishes special instruction and class drills in Delsarte and Swedish gymnastics, under a trained director. Exercise by prescription.

The Swedish Movement Department, both manual and mechanical, is the most extensive in the United States. Vibrating bars and seats, kneaders, rubbers, beaters, shakers, and manipulating appliances of all sorts.

The Electrical Department contains every improved appliance for medical applications of electricity, Galvanic, Faradic, Dynamic, and Static electrical apparatus and appliances for electrolysis, electro-cautery, etc.

An Aseptic Maternity on the cottage plan (steam heat and thorough ventilation), provides the best possible conditions for lying-in patients, with experienced professional attendance and rigorous aseptic management.

Special Departments for surgical cases, eye, ear, throat, and lung diseases, nervous diseases, genito-urinary diseases of men (non-specific), opium and alcohol habits, and diseases of women. A kindergarten and nursery, to keep the children happy and out of mischief.



SUMMER HOUSE AND FRESH-AIR INLET.

Three Fine Greenhouses, maintaining a magnificent collection of palms and various tropical flowers and plants, keep the house filled with bloom during the winter season. Flowers are everywhere indoors during the winter season. Patients can visit the greenhouse at any time without going out of doors.

Glass-Inclosed Sun-Parlors and Verandas for winter sunning and promenading.

Pure Water from sandstone rock.

There are from 250 to 300 Employes in the Sanitarium service the year round, of whom from 90 to 100 are medical attendants and nurses. Also seven thoroughly trained physicians, and a large corps of manipulators skilled in massage and the Ling system of Swedish movements.

The Sanitarium Training-School, in which our nurses are trained, is the largest and most popular in the United States. Its course of training is the most complete and thorough of any school.

Tri-Weekly Lectures on popular medical subjects by the physicians.

Abundant Means for Recreation indoors during inclement weather. Facilities for walking, driving, and horseback riding at all seasons.



ON THE LAWN.

The Sanitarium is Not a Pleasure Resort nor a fashionable hotel, but an ideal place for invalids needing good nursing, the benefits of regular habits and scientific professional care and treatment, and who desire to get permanently well.

The Sanitarium Nursery and Kindergarten. This enables mothers to bring little ones with them without being burdened with their care and supervision. The children have the advantages of kind and experienced teachers and ample playgrounds.

For Further Particulars, see large circular and card of rates.

J. H. KELLOGG, M. D., SUPT.,

Sanitarium, BATTLE CREEK, MICH.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., JUNE, 1892.

POISONOUS PRODUCTS OF DECOMPOSITION.

THE results of the decomposition of meats and other articles of food are of great importance to the public, because so much food stuff more or less altered by putrefactive processes is placed on the market and sold to consumers. Many authorities have made critical inquiries into the nature of the substances produced by decomposition, and have established the fact that a number of the chemical products generated are of exceedingly poisonous character. However, the nature of these poisons has been considered very little as yet in this country by investigators, and the people have not been taught the truth about them. The public does not realize the actual effect of the various products that are found, for example, in putrefying meat. It is not uncommon nowadays, to see on the menu of the gourmand, several articles of diet which, on being tasted, prove to be more or less rotten. If one will visit the so-called "high-life restaurants" of large cities, and call for duck, plover, snipe, and various kinds of "toothsome" game, he will generally receive specimens that offend the sense of smell and taste as putrefying flesh. These are the so-called "ripe" or "seasoned" articles which "educated" (I would say, perverted) tastes relish.

In all these choice (?) morsels there is an actual quantity of vaccine generated by this so-called "seasoning process." Decomposition has produced some transformations, and has created some toxications. Though these substances may not be present in quantities sufficient to kill, or even to cause serious illness when taken once or twice, or even occasionally, yet they are nevertheless poisons; and just as one would not think of taking even the slightest dose of strychnine uselessly, one ought not to think of absorbing these cadaverous poisons at all.

It is not my purpose in this article to describe the numerous substances which chemists have isolated from putrefied substances, but merely to point to one which has long since been pointed out by Brieger and others. I have reference to the ptomaine known as nevrine. This is a substance which has physiological, physical, and chemical properties very much resembling true nevrine, hence the name given it by Brieger. Other names have been suggested, but it is doubtful if they are any better than this one.

The writer prosecuted the experiments of Brieger sometime since, and arrived at some results which the readers of this journal may feel interested in reading. The process followed to extract the nevrine from putrefying meat, was as follows (Brieger's):—

Finely chopped meat was diluted in a certain quantity of water and abandoned to putrefaction at summer heat for six days. Then it was boiled and filtered through a cloth by pressure. Then the liquid was boiled again with animal charcoal, and allowed to evaporate several times with absolute alcohol. This boiling in charcoal and extraction with alcohol was repeated until the solution was almost colorless. At this moment, chloride of platinum was added to the liquid, and a precipitate was produced. This precipitate was decomposed by H^2S, and the liquid was allowed to evaporate *in vacuo*. The residue was treated with absolute alcohol, which generated some little crystals in the form of needles. This is the substance which Brieger has termed putrefactive nevrine, as stated above. It has exceedingly toxic properties.

Experiments were made with this substance by inoculation in animals (cats, guinea pigs, and rats). There is very little difference in the action of this agent in these animals, except that some are more sensitive to it than others. From this point of view, as Brieger points out, the differences are quite marked; cats, for instance, are more susceptible than guinea pigs; rabbits also sustain its action better than cats. In experiments with small rabbits, a dose of .004 milligrammes of poison demonstrated symptoms of poisoning, but I had to use from .04 to .05 centigrammes to produce death with the symptoms which accompany it.

The action of this ingredient on respiration

is quite marked, even in small doses. It becomes more frequent, more pronounced; the mouth is opened larger, and the nostrils are more dilated. Dyspnœa, in other words, is more or less apparent, and in cases of fatal doses, respiration becomes irregular and slower before death.

The action of this agent on the circulation cannot pass unnoticed. The cardiac action becomes very frequent, sometimes so frequent that it is difficult to count the beats. This goes on progressively for a short time, and then gradually diminishes in a certain degree. In the case of death, the heart beats, even after breathing has stopped. When the effect of the drug upon the bowels is marked, it is shown by great peristaltic movement, causing continued evacuations which soon become of the consistency of diarrhea discharges. The urine is also sometimes passed involuntarily.

The pupil of the eye is occasionally greatly contracted, immediately after the injection of the drug; it gradually takes its natural shape or size in a short time afterward. The action on the secretions is well marked. There is a sweating of the nostrils and a discharge into the mouth, and from the lips, of a mucilaginous liquid. It is a viscous salivation which sometimes continues until death, according to the dose injected. This phenomenon generally precedes the embarrassment noticed in the act of respiration.

In small doses, the action of this chemical is not sufficient to cause pronounced nervous troubles. It requires fatal doses generally to produce anything like convulsions or spasmodic action of the system. When these symptoms occur, weakness becomes very apparent, and the animal can barely carry its weight.

Brieger discovered that atropine is a good antidote for this putrefactive poison. Whatever may be the intensity of the convulsions, salivation, and other symptoms, it seems that a small quantity of atropine in subcutaneous injections, generally succeeds in making all these phenomena disappear; the remarkable contraction of the pupil of the eye is readily counteracted.

It will be observed that if there is such an acute poison as this in putrefaction (and this is only one of many), meat or any other substance undergoing decomposition in any degree, ought not to be utilized for consumption. The inspection of meats in our public markets is carried on with very little regard, if any, to this question. It is desired to exclude from the table such meats as can be traced to animals which were diseased before slaughter; yet little if anything is done concerning the specimens offered having a slightly greenish tinge, such as is common to beef and other meats in warm weather. It is not uncommon to see in butchers' shops, livers, hearts, and other organs, black or greenish with the first processes of decomposition, offered for sale. Indeed, many such find their way to our homes and our tables.

It may be thought that such meats are safe when well cooked; but it is not so. Cooking only does away with the living germs. It destroys the germs, but it does not destroy the poison which they have generated before cooking. In the experiments related above, which gave results entirely like those of Brieger, it will be observed that the juice of the decomposed meats was boiled repeatedly, and after that, poison was found which, in minute quantities, was capable of causing death.

Query About the Yeast Plant. — The Director of the Laboratory some time since received the following letter:—

"DEAR SIR: Is there now, or will there be sometime in the near future, a chance to get questions answered through the BACTERIOLOGICAL WORLD AND MODERN MEDICINE? For example: I wish very much to know more about the yeast germ. In watching the processes of fermenting bread, I see so many evidences of animal life, that I cannot resist the conviction that the active agent is an animal microbe. Is the evidence absolute and positive that this germ or cell is vegetable? Or may not a more powerful microscope than any yet in use reveal the fact that this and many other microbes now supposed to be of vegetable growth, are animals, and give off poisonous excretions as animals do?"[1] . . .

In answering this question, it would perhaps be unnecessary to go deeply into the nature of the yeast plant, were it not for the fact that many persons who have not studied this question closely, seem in doubt; but to those who have studied the smaller organisms closely, there is no necessity whatever of saying a word on the subject.

The "yeast germ," as the querist calls it, is known technically under the name of *saccharomyces cerevisiæ*, and, according to Dallinger, they are probably degraded forms of ascomycetes. In their zymotic action and in their simple character, they resemble somewhat the bacteria. The organism magnified four or five hundred diameters appears in the shape of a

[1] The writer asks if we will not establish a Question-Column in this journal. We beg to answer that for this year we are scarcely prepared to undertake the task. Perhaps later on we will be able to grant his request.

globular or ovoid cell, from about $\frac{1}{2500}$ to $\frac{1}{300}$ inch in diameter. The cell may be isolated, or several of them may be connected together in short strings or series. In the interior of the cell may be noticed colorless material (endoplasm) containing usually some vacuoles.

The phenomenon which the writer has observed and compared to animal life, is simply due to the exceedingly rapid multiplication of the yeast plant in the proper medium, a fermentable substance. There is nothing, then, indicating that it is of animal nature; the fact is, it is absolutely proven, and no one doubts the fact among scientists, that the yeast microbe is a plant, and a comparatively large one at that. A microscope magnifying ten thousand times more than the best we have, would not increase the certainty of this, for it is established by the nutrition, by chemical tests, and by reliable microscopical technique well known to-day.

TECHNIQUE.

PRACTICAL POINTS IN HANDLING OBJECTIVES TO OBTAIN BEST DEFINITION.

THE *Microscope*, Wash., D. C., May number, prints the following important note quoted from Queen's "Pocket Catalogue:"—

"If you want to compensate for thinner cover-glass, set the systems of your objective further apart; or the same purpose may be effected by lengthening the tube of your microscope. If, on the contrary, you want to correct for a thicker cover-glass, set the systems closer or make your tube shorter.

"I. Thicker cover, longer tube, and opening systems tend to over-correction.

"II. Closing systems, thinner cover, and shorter tube tend to under-correction.

"For the recognition of under or over correction by the appearance of the object, the writer has found the method of E. Gundlach to be of great practical value; and he would urge careful practical study of these appearances as affording a guide to the kind of correction needed, whether 'under' or 'over.'

"To illustrate the practical use of the above, suppose, for example, a condition of under-correction of 'general spherical aberration;' then either of the conditions named will afford counteraction or correction, *i. e.*, either thicker cover-glass, longer tube, or opening systems of objective, whichever may be most convenient or practicable. It is, of course, in many cases impossible to alter the distance of lens-systems, owing to the objective being in a fixed mount, not adjustable; in such cases one of the other correctives may be applied."

How to Obtain Pure Cultures of the Bacillus of Tuberculosis.—Mr. E. Pastor recommends the following new process: The existence of the bacillus in sputum being known, the patient is made to rinse the mouth and throat thoroughly with sterile water, which is poured directly into a sterile vessel (large test-tube would do). This material is filtered through gauze to separate the largest particles, a little more sterile water is added, and the whole is shaken violently. A few drops of this liquid are mixed with gelatinous culture which is then spread over a glass plate. In three or four days, the foreign microbes show their development. All the spots thus affected are cut out, and the clear patches left between them are deposited in tubes of blood serum. It is rare that these clear spots do not contain germs of consumption which grow later in the serum.

Cultures from tubercles or lung cavities may be made by the same process of dilution, etc.

GLYCERINE.

COLE, in a note printed in the *American Monthly Microscopical Journal*, says:—

"C_3H_53HO is the hydrate of the trivalent radical glyceryl. It is a sweet, syrupy liquid, obtained by the decomposition of fats and oils, principally as a by-product in the manufacture of candles and soaps. The fatty acids are used to make candles and soaps, when combined with soda or potash. Pure glycerine is colorless and odorless, freely miscible with water and alcohol in all proportions; but with oils it only emulsifies, and does not perfectly blend. It is a solvent of many alkaloids and their salts, as well as resins. The purest is prepared by distillation; although not volatile without decomposition, yet it passes over undecomposed in the vapor of water, and may be concentrated by careful evaporation. This mode of preparing it was patented by Price's Candle Company, but now much distilled glycerine is imported from Germany. Glycerines of inferior quality have a disagreeable smell, and are sometimes colored. Good glycerine should not be colored after being subjected for two hours to the action of an added solution of the nitrate of silver."

Method of Staining the Parasites in Cancer-cells.—M. Soudakewitch, in a study of the parasitism of cancers, gives the following

method for staining: The sections are made with a microtome, inclosed in celloidine, and colored by different methods. Chief among the stains used are boric carmine, taking for supplementary color, aqueous methylene blue, iodinized green, or hæmatoxylon and eosine. In 59 cases of cancers thus studied, the author always found intra-cellular, and sometimes intra-nuclear parasites (See translations of this article, in the May number and in this issue.)

Smith's Method of Drawing. — The *Am. M. Microscopical Journal* publishes the following original method of drawing: "Place the body of the microscope horizontal; remove the mirror; put the slide on the stage; condense the light upon it by means of the bull's-eye, taking care to center the light; attach the concave mirror to the front of the eye-piece by means of a spring or a piece of thin wood. Have its surface at an angle of 45° with the plane of the anterior glass of the ocular. This will project an image of the object on the paper beneath. If the outer ring of light is circular, there will be no distortion. With a black cloth exclude all outer light, covering both your head and the instrument. Mr. Hopewell Smith draws any section easily in this manner, including magnifications of 600 diameters."

Lustgarten's Method of Coloration. — The claim of Lustgarten that he had discovered the bacillus of syphilis, is contested by M. Sabouraud, of the laboratory of Dr. Taperilt, of the Hospital St. Antoine, Paris. This method is as follows: —

1. Sections of syphylitic productions in cover-glasses smeared with specific exudate of chancre, are kept during 24 hours at cold temperature, or two hours at about 60° C. in a coloring bath composed as follows: Saturated alcoholic solution of gentian, violet, 11 parts; aniline water, 70 parts.

2. Coloration is followed by washing for 10 minutes in absolute alcohol.

3. The preparation is subjected, during ten seconds, to the action of permanganate of potash, in a solution of 1½ per cent.

4. Finally: decoloration in fresh aqueous sulphurous acid solution. It will be necessary to repeat this decoloration as often as will be necessary to complete it.

Dr. Sabouraud has in vain tried this method. He has found that it can color the bacillus of tuberculosis, but it does not seem capable of demonstrating the germ of syphilis.

ANTISEPTIC.
PROPHYLACTIC.
DEODORANT.

LISTERINE

NON-TOXIC.
NON-IRRITANT.
NON-ESCHAROTIC.

FORMULA.—Listerine is the essential antiseptic constituent of Thyme, Eucalyptus Baptisia, Gaultheria, and Mentha, Arvensis, in combination. Each fluid drachm also contains two grains of refined and purified Benzo-boracic Acid.

DOSE.— INTERNALLY: One teaspoonful three or more times a day (as indicated), either full strength or diluted, as necessary for varied conditions.

LISTERINE is a well-proven antiseptic agent — an antizymotic — especially useful in the management of catarrhal conditions of the mucous membrane; adapted to internal use, and to make and maintain surgical cleanliness — asepsis — in the treatment of all parts of the human body, whether by spray, irrigation, atomization, or simple local application, and therefore characterized by its particular adaptability to the field of

PREVENTIVE MEDICINE — INDIVIDUAL PROPHYLAXIS.

LISTERINE

Destroys promptly all odors emanating from diseased gums and teeth, and will be found of great value when taken internally, in teaspoonful doses, to control the fermentative eructations of dyspepsia, and to disinfect the mouth, throat, and stomach. It is a perfect tooth and mouth wash, *indispensable for the dental toilet.*

Descriptive Literature upon Request.

LAMBERT PHARMACAL CO., ST. LOUIS, MO.

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S MAW SON & THOMPSON, LONDON, E. C.
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Pharmaceutical Specialties

PHENACETINE-BAYER

Antipyretic
Analgesic, or
Anodyne

PHENACETINE-BAYER IS A TRUE AND DISTINCT ORGANIC DERIVATIVE, not a mechanical mixture. It is indicated in influenza (la grippe), in all fevers, with or without pain, rheumatism and rheumatoid maladies, neuralgia, bronchitis, phthisis, pertussis, and the gastralgias. Phenacetine-Bayer acts promptly, and is both safe and effective. It is supplied in ounces, tablets and pills.

SULFONAL-BAYER

Hypnotic
Antineurotic
Nerve Sedative

INSOMNIA OF ALL KINDS YIELDS PROMPTLY TO SULFONAL-BAYER. It is useful in simple insomnia and in the cerebral disturbances of insanity. It is a pure hypnotic, a safe and effective remedy, and it does not give rise to a drug habit. As its action is slower than that of the narcotics, it must be administered properly (*see pamphlet*). Sulfonal-Bayer is supplied in ounces, tablets and pills.

EUROPHEN

(A CRESOL-IODIDE IODOFORM SUBSTITUTE)

Antiseptic
Antisyphilitic
Local Stimulant

AS A SUBSTITUTE FOR IODOFORM, Europhen is winning an enviable place in therapeutics. It has a special value in specific lesions; while as a surgical dressing in ulceration, open wounds, and septic conditions of the cavities, it has given excellent results. It is supplied in ounces. Europhen-Aristol, a combined product consisting of equal parts of each medicament, is also supplied in ounces.

ARISTOL

(A THYMOL-IODIDE IODOFORM SUBSTITUTE)

Antisuppurative
Antiseptic
Cicatrisant

THE VALUE OF ARISTOL in all the morbid conditions formerly treated by iodoform is widely recognized. In all external traumatisms, in cavital lesions and in many of the dermatoses it has given very satisfactory results. As a surgical application, it is safe, inodorous and non-toxic. Aristol is supplied in ounces. Europhen-Aristol, a preparation consisting of equal parts of each medicament, is also supplied in ounces.

DESCRIPTIVE PAMPHLETS FORWARDED ON APPLICATION.

W. H. Schieffelin & Co., New York.

PUBLISHERS' DEPARTMENT.

CONTENTS OF LIPPINCOTT'S MAGAZINE FOR JUNE.—"White Heron" (portrait of author), M. G. Mc Lelland; "The Newspaper Illustrater's Story," (Journalist series, illustrated), Max de Lipman; "Betrothal" (a poem), Edgar Saltus; "In a Castle Hall" (a poem) (portrait of author), Rose Hawthorne Lathrop; "Peary's North Greenland Expedition" (illustrated), Benjamin Sharp, W. E. Hughes; "Clearing Off" (a poem), Harrison S. Morris; "Unc' Ananias" (illustrated), Molly Elliot Sewell; "Canoe Life" (Athletic series, illustrated), W. P. Stephens; "The Gates of Death" (a poem), Flavel S. Mines; "Geographical Fiction," Gertrude Atherton; "Trials of a Publisher," Agnes Repplier; "Ashes and Incense," Robert Burns Wilson; "An Old Boston Magazine," Joel Benton; "As It Seems"; "With the Wits" (illustrated by leading artists).

THE MISSISSIPPI VALLEY MEDICAL ASSOCIATION will hold its eighteenth annual session at Cincinnati, Wednesday, Thursday, Friday, Oct. 12, 13, 14, 1892. An excellent program, containing the best names in the valley and covering the entire field of medicine, will be presented. An address on Surgery will be delivered by Dr. Hunter McGuire, of Richmond, Va., President of the American Medical Association. An address on Medicine will be made by Dr. Hobart Amory Hare, Professor of Therapeutics and Clinical Medicine, Jefferson Medical College, Philadelphia. The social as well as the scientific part of the meeting will be of the highest order.

The Mississippi Valley Medical Association possesses one great advantage over similar bodies, in that its organic law is such that nothing can be discussed during the sessions save and except science. All ethical matters are referred, together with all extraordinary business, to appropriate committees—their decisions are final and are accepted without discussion. The constitution and by-laws are comprehensive and at the same time simple. Precious time is not allowed the demagogue or the medical legislator. The officers of the Pan-American Medical Congress will hold a conference at the same time and place.

CHARLES A. L. REED, M. D., Cincinnati, President.
E. S. MCKEE, M. D., Cincinnati, Secretary.

A NEW, SAFE METHOD OF ADMINISTERING TOXIC MEDICAMENTS.—A new departure in therapeutical posology marks a recent enterprise of Parke, Davis & Co., Detroit, Mich., which is in the interests of progress, economy, and exactness.

The increased knowledge resulting from research in the fields of botany, chemistry, physiology, pharmacy, and materia medica has created a demand on the part of the medical profession for the essential or active principles of drugs in preference to the more cumbersome, less definite, pharmaceutical preparations which custom and authority have so long sanctioned.

Not a few alkaloidal principles of drugs have been isolated, and are now frequently prescribed. The conservative element of the profession has, however, in view of the toxicity of certain isolated medicinal principles, and the acknowledged variety of strength and activity of products of this character of different manufacture, been loath to employ them when indicated.

The doses sometimes being fractions of a thousandth or a hundredth, it is not possible for the physician to always bear them in mind, and in prescribing he is often in doubt as to what constitutes the proper therapeutical dose, and what the dangerous toxic one.

Dr. E. Trouette, in a paper read before the Paris Academy of Medicine, and published in the *Revue de Therapeutique*, entitled "Duodecimal Doses of Toxic Medicaments," proposes a method of obviating the difficulties hitherto preventing the general use of many valuable medicinal principles. The plan he proposes is a new method of posology based on the rational division into twelve parts of the maximum dose which may be given to an adult in twenty-four hours.

The advantages claimed for this method are, first, accidental poisoning need no longer be feared. Second, dangerous medicaments may from the outset be given in efficient dose without the least risk.

Parke, Davis & Co. have prepared diurnules and Diurnal Tablet Triturates of a large number of toxic medicaments, and will afford the profession full information concerning this new method of posology, with reprint of Dr. Trouette's article.

HORLICK'S Malted Milk is daily coming into extended use and prominence as a food for infants and for nursing mothers. Some infants thrive better on it than on cow's milk, and it is often retained and assimilated where everything else is rejected.

It is being used not only by physicians in their practice but in most of the principal asylums and hospitals for children all over the United States, and seems to be giving excellent satisfaction everywhere. The factory near Racine, Wis., is located in the finest farming district of the Northwest and is surrounded by everything favorable to the production of a perfect infant food.

TWO HARVEST EXCURSIONS via the Chicago, Milwaukee & St. Paul R'y, on Tuesday, August 30th, and September 27th, 1892.

Where the grasses are kissed by the wand'-
ring breeze,
And the fields are rich with the golden grain;
Where the schooner plows through the
prairie seas
To its destined port on the western plain;
Where homes may never be sought in vain,
And hope is the thriftiest plant that grows;
Where man may ever his rights maintain,
And land is as free as the wind that blows.

For further particulars apply to the nearest ticket agent, or address Harry Mercer, Michigan Passenger Agent, 82 Griswold Street, Detroit, Mich.

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., JULY, 1892. NO. 9.

ORIGINAL ARTICLES.

STUDY OF IMMUNITY.

BY M. METCHNIKOFF.

II.—IS THE SERUM OF VACCINATED RABBITS BACTERICIDE OR ANTI-TOXIC?

RABBITS vaccinated by sterilized blood have always been tested with fresh blood emanating from pigeons or rabbits having died from hog cholera. This blood is inoculated under the skin of the rabbits. The intravenous injections are avoided because they are always mortal for rabbits, the blood and organs of which, inoculated after death, remain, however, occasionally sterile.

While the witness subjects inoculated under the skin, died within twenty-four hours, the vaccinated rabbits, after the test (or proof), presented only suppuration at the inoculated spot.

When the rabbits thus tested had completely recovered from their malaise, at very different periods (five, six, seven, eleven, thirteen, sixteen, nineteen, fifty days after the test of inoculation), some arterial blood was drawn under strictly aseptic rules, and was allowed to coagulate to obtain the serum. This blood put in test tubes in quantities of 5 to 10 c. c. was inoculated with a platinum wire containing blood of pigeon or rabbit which had succumbed to hog cholera. The same method has been practiced with serum of non-vaccinated rabbits.

In all cases without exception, there appeared a rich culture of *cocco-bacillus suinum* in the serum of vaccinated and new rabbits. A few hours after the sowing in the tubes, a light cloud developed uniformly in all the mass of serum. The next day it was filled with a great quantity of bacilli of hog cholera, scattered throughout the liquid. A singular thing,—the serum of vaccinated rabbits developed without exception cultures richer in bacilli than that of non-vaccinated rabbits.

Examined with the microscope, these cultures presented quantities of oval bacteria in the form of mono- or diplobacilli. The chain composed of four cells or more, was found only exceptionally in the serum of the vaccinated and in the serum of the new rabbits.

We may conclude, therefore, that the serum of the vaccinated rabbits, and even the serum of those hyper-vaccinated, allows a very abundant growth of the microbe of hog cholera which develops itself under an aspect and with forms absolutely normal.

The serum of vaccinated rabbits incapable of killing or of stopping the development of the bacteria of hog cholera, would seem to possess the property of destroying the toxic substances of this microbe, or stopping their action in the organism of rabbits.

To elucidate this question, we have followed the method employed by M. Behring; we have left quantities of toxic blood (that is to say, blood of rabbits having died after a super-acute infection and heated 50° C. one hour), capable of killing rabbits, in contact with the serum of rabbits vaccinated or hyper-vaccinated against the microbe of hog cholera. A volume of toxic blood with the addition of a volume of distilled water was mixed with two, or oftener with four, volumes of serum of refractory rabbits. The mixture was preserved in the laboratory in a cool place during sixteen, eighteen and a half, twenty, and twenty-four hours.

The same quantities of toxic blood, with the addition of its volume of water, were mixed in the same proportions with serum of new rabbits not vaccinated. The mixture was preserved during the same time and in the same conditions as

that of the toxic blood and the serum of the vaccinated rabbits.

Five experiments made with these mixtures have demonstrated the total absence of anti-toxic property of the serum. Notwithstanding the variations in the individual receptivity, the five rabbits which received the mixture of toxines with the serum of the vaccinated, all died in forty-five minutes, one hour and seven minutes, one hour and twenty-five minutes, fourteen, and forty hours. The rabbits inoculated with the mixture of toxic blood and of serum of new rabbits died also in the space of eight minutes, one hour and ten minutes, two hours, two hours and ten minutes. Another died only the eleventh day after inoculation. But notwithstanding this long survival in this witness case, we see that *neither the serum of the new rabbits nor the serum of the vaccinated rabbits exerts any influence on the toxine of hog cholera.*

The differences observed in the time of the death of the rabbits should be considered rather as the result of individual sensitiveness to the effect of the toxines.

The witness rabbits which received the toxic blood alone without addition of any serum whatever, died between one hour and fifteen minutes, and four hours and eight minutes after the injection. The blood which served for the experiment on the anti-toxic properties of serum of vaccinated rabbits was withdrawn five, eleven, thirteen, and nineteen days after the test inoculation, when the rabbits presented no more malaise. In one experiment, made with the blood of one hyper-vaccinated rabbit, the blood was withdrawn forty days after the last proof inoculation with the living virus, and four days after an intravenous injection of 2 c. c. of toxic blood heated to 58° C.

The facts observed *do not*, therefore, *permit the admission of the existence of an anti-toxic property of the serum of refractory rabbits against* the mortal virus of hog cholera.

III. — DOES THE SERUM OF VACCINATED RABBITS POSSESS THE PROPERTY OF ATTENUATING THE MICROBES OF HOG CHOLERA?

Let us now enter into the examination of the virulence of the *cocco-bacillus suinum* cultivated in the serum of vaccinated rabbits.

These cultures, injected in the veins or under the skin of rabbits, give a fatal disease to all of them without exception, but the animals always die later than the witnesses inoculated with cultures made in the serum of non-vaccinated rabbits.

While those witnesses, after an intravenous inoculation of culture in normal serum, died in a few hours, the rabbits inoculated with the same doses of culture in the serum of vaccinated rabbits died only at the expiration of three to five days. The survival is still longer after the subcutaneous inoculations of the same cultures.

The cultures in the serum of the vaccinated giving always a fatal disease, we cannot conclude that a considerable attenuation of the microbes occurred in this medium; nevertheless, we might be tempted to attribute to this serum a certain degree of attenuating power on the *cocco-bacillus suinum* because the malady lasts longer. To elucidate this question, it is indispensable to separate the microbes developed in the serum of vaccinated rabbits from this liquid, for it is possible that the serum alone may retard the march of the disease in inoculated rabbits.

As the bacilli of hog cholera produce a general turbidity in the serum of vaccinated rabbits, the only means of separating them from their medium of culture consists in isolating them by filtration. I have used paper filters through which I allowed the passage of the liquid of the cultures, and after which I washed in a few cubic centimeters of a physiological solution of chloride of sodium. Notwithstanding this washing, a portion of the substances of the serum naturally remained adhering to the microbes, which, as we know, are covered by a gelatinous sheath. Besides this inconvenience, there are several others: the paper filters cause the loss of a quantity of microbes which disappear with the serum and liquid of the wash. Another portion of bacilli remain adherent to the fibers of the paper. We only succeed, therefore, when rubbing the filter with a sterilized brush, in gathering a fraction of the microbes.

To give me an idea of the influence that such a method might exert, I have made a comparative experiment with the bacilli of hog cholera cultivated in the serum of a normal rabbit not vaccinated. A rabbit, inoculated in the auricular vein with 1 c. c. of such a culture died seven

hours and thirty minutes after the injection; another which received 1. c. c. of the residue of filtration of the same culture, died only in twenty-one hours (the weight of the two rabbits was about equal). There is, consequently, considerable delay in action, after the loss of microbes occasioned by the filtration and the wash.

Notwithstanding all the chances in favor of the diminution of the pathogenous action of the bacilli cultivated in the serum of vaccinated rabbits, the death of the rabbits inoculated with these filtrated cultures and washed in the manner indicated, always occurred sooner in the rabbits which received non-filtrated cultures. In one experiment, the rabbit inoculated with the residue of the filter died in eighteen hours, while its witness animal, inoculated with a non-filtrated culture, died or succumbed only one hundred and eight hours afterward. Sometimes the death of rabbits inoculated with bacilli freed from serum as much as possible occurs later, but in this case we observe, nevertheless, an influence of the serum.

Thus, two rabbits inoculated with the residue left on the filter, died in twenty-nine to forty hours, and their witnesses inoculated with the same culture not filtered died between eighty-five and two hundred and forty-four hours.

(To be continued.)

PUTREFACTIVE BACTERIA IN HEALTHY DEAD ANIMALS.

BY DR. SEGRI TROMBETTA.

Translated from *Centralblatt für Bacteriologie und Parasitenkunde*, by C. A, Cary, B. S., D. V. M.

The epoch-making investigations of Louis Pasteur have proved that putrefaction depends upon several different bacteria. It also depends upon moisture, temperature, and the presence of oxygen. Putrefaction takes place after death, and the bacteria spring from the greater part of the alimentary canal, pass through the intestinal walls, multiply, and penetrate the organs, the blood, and the tissues, causing all the phenomena that we denote by the name "putrefaction." The germs also enter the body after death, and we say that putrefaction had already begun or developed, resembling the greater or less changes which we, with naked eye, find in the tissues, the blood, and the organs.

Hauser, Zahn, and Foder have proved that these micro-organisms are not in the blood previous to the death of the healthy animal. It remains yet to determine at what period these migrations begin and how long after entrance, dead blood and organs remain free.

To determine whether the migrations succeed or follow, will appear the more important if one takes into consideration the fact that these small pathogenic organisms may be grown with other bacteria. We know, for example, that in this case there are organs and blood to examine, and bacteria therein to find, which have nothing to do with the morbid processes or pathological changes, and are first after death to enter and continue putrefactive action. In order to avoid mistakes it is necessary to determine how long after death the organs and the blood remain free from putrefactive germs.

The following questions only will solve the problem before us: Is there a point of time after death at which one can say that neither the organs nor the blood have been attacked, or visited by the micro-organisms of putrefaction? What is this point of time in the different animals? Have temperature, the weight, and volume of the animal an influence therein?

In order to answer these questions, I have experimented with mice, rats, and rabbits, — animals which are generally employed in advanced methods in bacteriological institutes. The management has been as follows: Every animal was killed by a stroke on the head, and subsequently kept for a certain time at brood or room temperature, or in an ice chest (0° to 4° C.) It was then dissected, and from the blood and the organs stab cultures in agar were made. A glance at the following tables is sufficient to give a distinct idea of the entire method of procedure. I hold it superfluous to add the control-experiments to the tables. The sign (+) means that the culture has

been positive, and the sign (—) indicates that it has been negative.

TABLE I.—MICE AT ROOM TEMPERATURE.

No.	Time of dissection after death.	Blood.	Liver.	Spleen.	Kidney.	Lung.
1	32 hrs.	+	+	+	+	+
2	30 "	—	+	+	+	+
3	28 "	—	—	—	—	+
4	26 "	—	—	—	—	—
5	24 "	—	+	+	+	—
6	22 "	—	—	—	+	—
7	20 "	—	+	+	—	+
8	19 "	—	—	—	—	—

TABLE II.—MICE IN ICE-CHEST.

1	29 hrs.	+	+	+	—	+
2	27 "	+	+	+	+	+
3	26 "	—	—	+	+	—
4	25 "	—	—	+	—	—
5	24 "	—	+	+	—	—
6	23 "	—	—	+	—	—
7	22 "	—	—	—	—	—

TABLE III.—MICE AT BREEDING TEMPERATURE.

1	8 hrs.	+	+	+	+	+
2	7 "	—	+	+	—	+
3	6½ "	—	+	+	—	—
4	6 "	+	+	—	—	—
5	5½ "	—	+	+	—	—
6	5 "	—	—	—	—	—

TABLE IV.—RATS AT ROOM TEMPERATURE.

1	24 hrs.	+	+	+	+	+
2	22 "	+	+	+	+	+
3	21 "	—	+	+	—	—
4	20 "	+	—	+	+	+
5	19 "	—	—	+	—	—
6	18½ "	—	+	+	—	—
7	18 "	—	—	—	—	—

TABLE V.—RATS IN ICE-CHEST.

1	29 hrs.	+	+	+	+	+
2	27 "	—	+	+	+	—
3	26 "	+	+	+	+	+
4	25 "	—	—	—	—	—
5	23 "	—	—	—	—	+
6	21 "	—	—	—	—	+
7	20 "	—	—	—	—	—

TABLE VI.—RATS AT BREEDING TEMPERATURE.

1	7 hrs.	+	—	+	—	+
2	6½ "	—	—	+	—	+
3	6 "	—	—	+	—	—
4	5½ "	—	—	+	—	—
5	5 "	—	—	—	—	—

TABLE VII.—RABBITS AT ROOM TEMPERATURE.

No.	Time of dissection after death.	Blood.	Liver.	Spleen.	Kidney.	Lung.
1	26 hrs.	—	+	+	—	+
2	22 "	—	—	—	—	—
3	21 "	—	—	—	—	—
4	19 "	+	+	+	—	+
5	17 "	—	+	+	+	+
6	16½ "	+	+	—	—	—
7	16 "	—	—	—	—	—

TABLE VIII.—RABBITS IN ICE-CHEST.

1	24 hrs.	—	—	+	—	—
2	23 "	—	—	+	—	—
3	22 "	—	—	+	—	—
4	21 "	—	—	+	—	—
5	20 "	—	—	—	—	—

TABLE IX.—RABBITS AT BREEDING TEMPERATURE.

1	9 hrs.	+	+	+	+	+
2	7 "	+	+	+	+	+
3	6½ "	+	+	+	—	—
4	6 "	—	—	—	—	—

From the preceding tables the following summary may be derived :—

	At Room Temperature.	At Ice-chest Temperature.	At Breeding Temperature.
For Mice...	19 hrs.	22 hrs.	5 hrs.
For Rats....	18 "	20 "	5 "
For Rabbits.	16 "	20 "	6 "

The following conclusions are drawn from the foregoing :—

1. There is a time limit, during which the blood and organs of the healthy dead animal remain free from putrefactive bacteria.

2. This limit for mice, rats, and rabbits is as represented in the summary.

3. This limit applies to aërobic germs and the entire healthy dead animal. That anaërobic bacteria flourish after the death of the animal in the blood and organs has been, for a long time, settled ; but these have no pathological signification. In one disease they hasten the putrefactive process ; in another, on the contrary, they check putrefactive ravages.

4. The temperature of the ice-chest retarded the wandering of the putrefactive bacteria in a slight degree, while the breeding temperature greatly accelerated or hastened their migration and development.

5. The time when the putrefactive process begins varies with the volume of the animal, but not in direct proportion to it. In mice, during the first 19 hours the blood and organs remained free from putrefactive bacteria; but the limit diminished slightly in rats (18 hours), sinks still lower in proportion to the volume of the animal in rabbits (16 hours). So remains the relation at room temperature, and almost equally does this proportion apply at ice-chest temperature. Only the breeding temperature hastened the putrefaction in the small animals; this difference is of no special importance.

6. The putrefaction advanced irregularly. The abdominal organs were attacked first by the bacteria, while the blood of the same animal remained free. Among the organs the spleen decomposed first; next the liver, spleen, and kidney together; also in some cases, the blood and organs begun to decay at the same time. Many times one could discover first in the lungs the previous existence of micro-organisms. It is apparently true that these germs are present in the lungs during the life of the animal. The blood was only, in one instance, last to be attacked by putrefaction.

7. The species of animal exerted no influence upon the process of putrefaction.

DOUBLE CHANCRE À DISTANCE.—AN INQUIRY INTO SYPHILITIC AUTO-INOCULATION.

BY A. H. OHMANN-DUMESNIL, M. D.,

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(Concluded.)

In the first place I wish to call attention to a very interesting and brief *résumé* on the subject by Dr. E. L. Keyes. In one case (his own) excision of the chancre was performed before the lesion was twenty-four hours old and before any induration had manifested itself. It proved unavailing as far as preventing the general symptoms from appearing was concerned. In commenting upon this the author says: "This case I consider worthy of record because it fulfills the most exacting conditions for testing the question still under consideration in the profession, as to whether syphilis is or is not already a constitutional disease when the chancre appears." In Berkeley Hill's case, cited in the same paper, a man tore his frenum during intercourse and in less than twelve hours later had the wound thoroughly cauterized with fuming nitric acid. A month later a general syphilis manifested itself. Leloir relates an analogous case. A medical student had a suspicious intercourse and watched his penis constantly for any sign of the chancre. One night at twelve o'clock nothing was apparently visible. The next morning he noticed a macule. This was largely excised at two o'clock in the afternoon of the same day, but the uselessness of the measure was shown by the appearance of general syphilitic manifestations later on.

Barthèlemy reports a case of undoubted indurated chancre accompanied by ganglionic involvement in which the induration of the sore persisted for three months, and of the glands for four months. No treatment whatever was given, and eighteen months later no general manifestations had shown themselves. The author asks the question, Had I excised the sore would I not have ascribed the mitigation (?) of the disease to that operation? He might have asked himself, Was the case one of syphilis?

Zeissl has observed that the excision of the induration does not prevent the appearance of secondary symptoms; and Depech has noted, as well as others, that after excision the induration is reproduced at the site of the operation, and secondary symptoms follow.

Spillmann protests energetically against the abortive surgical measures employed in reference to syphilis. To emphasize his opinion he reports two cases as follows: —

He excised the chancre and the glands anatomically connected with it, in a case. No cutaneous lesions appeared, nor any implication of the mucous membranes. Internal treatment was not taken, and confirmed tabes dorsalis was established. In the second case a young woman was supposably infected by her lover. Suspecting that this might occur he caused her to be very carefully watched for any signs of a chancre. This lesion was excised as soon as it made its appearance; yet, despite his precaution, roseola of the trunk and abdomen appeared as well as buccal and vulvar lesions.

In one case I excised the chancre largely as soon as it appeared. General symptoms came on nevertheless, in a mitigated form, it is true.

In some of the cases just given extirpation of the initial sclerosis was practiced as soon as it was possible to do so, and yet the results were negative. We must conclude from a clinical point of view that in those cases the disease was constitutional at the time the chancre was excised. The sores were only suspected, as the principal signs of differentiation were absent, and it could be very well argued that, had one been excised and not been followed by general symptoms, the sore was not an initial sclerosis in spite of confrontation with the probabilities in the case.

We will now take up some of the reported cases of successful auto-inoculation and examine them critically. First, we will take the cases reported by Pontoppidan (16). 1. Patient with ulcer in the sulcus coronæ, having slight induration. Inoculated in three places on the abdomen. On the eleventh day slight infiltration of base observed.

2. Infection dating back three weeks. For past fifteen days excoriation on prepuce and ulcer in sulcus coronæ. Later, sclerosis about urethral orifice. Three inoculations on abdomen appeared as papules on the twenty-second day.

3. Infection a month old. Sclerosis in sulcus coronæ. Inoculation showed papules on the thirteenth day.

4. Infection four weeks back. Inoculation showed elevated reddened places on the twelfth day. On the nineteenth, papules, and on the twenty-sixth, a syphilitic eruption.

5. Infection dating back twelve days. Inoculation visible on the fourteenth day, reddened on the eleventh, and papular on the eighteenth.

Haslund reports five cases of multiple chancres due to auto-inoculation, a brief notice of which is as follows : —

1. Ulcer of prepuce, near frenum, superficial. Six days later indurated, as also inguinal gland. Two days after, it was excised. Ten days later, a small ulcerated point due to the tearing out of a suture, indurated; and a few days later there was found a small ulceration at the meatus urethræ which became distinctly indurated. Four weeks later a macular syphiloderm appeared.

2. Small excoriation of frenum. No induration. Cauterized with chromic acid and dressed with chloride of lime. Five days later wounds became indurated. In two more days, two superficial erosions, one on internal surface of prepuce, the other in the sulcus coronæ. In three days one sore indurated and a new ulcer in the middle of the balano-preputial sulcus. Ten days later there were eleven indurated ulcers. About a month later abundant macular syphilide. A number of the ulcers healed, leaving a well-developed induration.

3. An indurated ulcer on the left side, in the sulcus coronæ. Left inguinal ganglia indurated. Two days later an indurated ulcer on the inner surface of prepuce. A month later macular syphilide appeared.

4. An indurated ulcer in the sulcus coronæ, a little to the left of the median line. Three days previously one had appeared on the right side on the preputial portion of the sulcus coronæ. Ganglia indurated on right side. In about forty-two days a papular eruption appeared.

5. Right labium majus affected with two indurated ulcers; two smaller ones, also indurated at posterior commissure and on perineum to the left of the raphé. Glands in both groins involved, very typical on the right side. Five days later an indurated ulcer on internal aspect of left labium minus. Twenty days later macular syphilide appeared.

A critical examination of these cases would lead us to look upon them as special pleas. Mracek, in reviewing Pontoppidan's cases, states that, as proofs of the auto-inoculability of the chancre, they have but little weight. In Case 1, of Pontoppidan's experiments we have an inoculation made with pus, and *slight infiltration* observed in the inoculations; in Case 2, also, purulent inoculation and papules appeared on the thirty-seventh day after appearance of ulcer; in Case 3, we have insufficient data, papules appearing; in Case 4, we have elevated reddened places as the result of inoculation, papules appearing on the nineteenth day, and *one week later* a syphilitic eruption; in Case 5, the inoculation was *visible* on the fourth day and papular on the eighteenth. We do not find a description of an initial sclerosis in any one of these inoculations, and the author simply pre-

sumes that because lesions appeared at the site of inoculation they must be chancres. In Haslund's cases we find that the ganglionic involvement is always on the same side as the original chancre (Cases 1, 2, 4, and 5); and that when the other side is involved there are general symptoms appearing, or other portions of the lymphatic system are also involved (Cases 1, 3, 4,). In these cases the auto-inoculations are also supposed to be the result of the action of pus.

Taking the *tout ensemble*, it will occur to any fair-minded person that these examples are not satisfactory, nor are the experiments crucial. In reported successful cases we also note that an infiltrated sore is most generally the result of the inoculation. Even if an apparent induration takes place, there is no corresponding induration of the lymphatic ganglia anatomically connected with the artificially produced lesion, unless it be at the time that general involvement of the lymphatic glands takes place.

We must not forget that inoculations, more especially when pus is employed, are irritating, and the resulting lesion is what has been denominated the "irritative sclerosis" of syphilis.

Taking all these points into consideration it seems to me that: 1. the probability of auto-inoculation in early syphilis has not been proven; 2. while there may be strong presumptive evidence in favor of it, it is only at best a possiblility; 3. the most crucial experiments prove that excision of the chancre at the earliest possible moment is futile and falls short of its purpose; 4. in multiple chancres *à distance* the lesions are due to the same inoculation, as a rule; 5. in multiple chancres of different ages it is probable that the younger lesions are merely irritative scleroses; 6. experiments so far apparently prove that syphilis is constitutional at the time the initial sclerosis makes its appearance.

Note. — The following authorities are among those consulted in the preparation of this paper: —

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PROTOPLASMIC FOCI-THEORY OF METABOLISM.

An Elaboration of the Views contained in the Paper read by Dr. Morton at the First Meeting of the American Electro-therapeutic Association.

by horatio r. bigelow, m. d.

(Concluded.)

Now it will be seen that the first action going on in the cell is a destructive one — katabolism, oxidation, or whatever else we choose to call it. The positive zinc attracts oxygen which is negative. A zinc atom combines with an oxygen atom. A recombination of oxygen and hydrogen takes place all along the line, leaving hydrogen free at the copper. Then the zinc which has formed zinc oxide, changes places with the hydrogen of the sulphuric acid, and molecules of zinc sulphate and water are formed. The initial change is destructive — oxide of zinc. What the initial impetus is that is required to separate a molecule of water we do not know; and it would be valueless speculation to argue the matter. This destruction is followed immediately by construction, anabolism following katabolism. It is, however, to be noticed that the synthetical compounds are formed directly from the products of decomposition, and while it is not yet proven to be so, yet there is strong evidence that urea is also formed in the body in this same way. Now urea, as Foster says, is the main end product of proteid metabolism. The synthetical process of the hepatic cells, which gives rise to urea, is not unlike the changes that go on in the voltaic cell. For it is not at all stretching the imagination to look upon every cell as a complete battery, the albuminous liquor of which may be the electrolyte. To go a step further we may even believe that each ultimate division of protoplasm is an electro-positive or an electro-negative focus, and that the various changes of nutrition that go on in the human body normally or pathologically, are merely evidences of attraction or repulsion, of destruction or construction, of analysis or synthesis, of anabolism or katabolism.

Cells react upon each other by virtue of an electrical potential, and disease is the expression of a difference of potential,

by which waste products are formed. Of course, it goes without saying, that the primary concept was anabolic, but since that first great fashioning, life came only from death. The purely anabolic processes of metabolism are very few, if indeed they exist at all. What are called synthetical processes *do* exist, I believe, and from the nature of things *must* exist in a certain definite ratio; and these may arise immediately from the analytical process, and not alone from the products of such analyses. Dr. Morton uses katabolism and oxidation synonymously, because he looks upon metabolism as an expression of the law of a protoplasmic voltaic couple, or as he says: "By katabolism I mean oxidation and combustion; the result is a new product — this may be an end product, H_2O, CO, urea, or not an end product; oxidation is synthesis. But the electrolyte undergoes analysis. The negative plate again is the seat of synthesis, but it is another kind of synthesis; the products are *not* end products; they are just the contrary; for they are reduced or as far away from end products as they can be; they are not now oxidizable fuel out of which to make end products; but the oxidation at the positive element makes true end products, *i. e.*, ultimately oxidized. I would say, then, in my theory: —

"Positive elements give end products (katabolism) — synthesis; negative element gives reduced products (anabolism) — synthesis; the electrolyte gives decomposition products — analysis."

By the destructive metabolism going on in the animal cell kinetic energy is liberated, carbonic acid, water, and urea being burnt off in the protoplasm. This is plainly a katabolic process — one of combustion. The energy that is stored in the cell does not equal that which is expanded. Halliburton (Text Book of Chemical Physiology and Pathology) says: "While a cell is alive, it is always undergoing certain chemical changes. During assimilation it is building up its own substance from other material, which is called food. On the other hand it is undergoing retrogressive metamorphoses, and this is especially increased during activity. The destructive chemical changes in a muscle are for instance more marked during its contraction than when it is not contracting. The chief destructive changes that occur are of the nature of oxidation. Carbon unites with oxygen, and carbonic acid is given off; hydrogen unites with oxygen to form water; nitrogen is burnt off in the form of imperfectly oxidized substances, of which the chief are urea (CON_2H_4) and uric acid ($C_5H_4N_4O_3$); but other substances like xanthine, hypoxanthine, kreatin, etc., are also formed, and will be generally found in minute quantities in organs composed of cells; sulphur passes off in the form of sulphates. These combustion changes represent a transformation of energy; the potential energy of chemical affinity is transformed, and exhibits itself partly as heat, partly as electrical change, partly in the form of mechanical work." This end product of urea, of which we know so little, and yet upon a just knowledge of which so much depends, may be, probably is, the result of the breaking up of the electrolyte. All the elements necessary to disengage electric energy are present in protoplasm. *Nuclein*, for instance, is a compound of carbon, hydrogen, nitrogen, sulphur, phosphorus, and oxygen.

Protoplasm contains 80 to 85 per cent of water and 15 to 20 per cent of solids. These latter (following Halliburton) are chiefly proteids, but in addition, small quantities of fats, carbo-hydrates, like glycogen and inosit and inorganic salts, especially of potassium, are present. By decomposition within the body, these "proteid" or "albuminous" substances, give off carbonic acid, water, and urea as final products, together with other intermediate products. That is, an electrolysis has been originated. Latham, quoted by Halliburton, shows how, by a rearrangement of atoms different from that occurring in normal metabolism, excess of sugar may be produced in diabetes, excess of uric acid in gout, and certain ptomaines in other complaints. This rearrangement of atoms may be due to differences of polarity. The katabolic changes being the initial ones, the oxygen goes to the zinc. Berthelot has shown that the union of oxygen with hæmoglobin is attended with an evolution of heat. His measurements show that about 14.77 calories are produced for each 32 grammes of oxygen combined. Thus a balance of power is maintained, an equilibrium of temperature between the blood flowing to the lungs and the

blood leaving the lungs. This is an important factor in the study of the polarity of pulmonary diseases. During fever there is great increase of body metabolism, which fact has been established beyond all doubt by the study of the nitrogen excreta and oxygen consumption at that time. This is important also in a study of the polarity of febrile disease. Diabetes with its sugar, the uric acid diathesis, also furnish guides for intelligent electrical treatment. The hydrogen atom, which went to the copper of the voltaic couple, and which is a most important element in the animal economy, plays a prominent rôle in oxidation. It matters not whether the element exist in a chemical compound, or whether it be free. One grm. of hydrogen in combustion will set free 34.5 calories; carbon will set free only 8.1; urea, 2; albumen, 5.8.

Dr. Morton's theory is a beautiful and original one, and when thoroughly elaborated must give us the only guide possible to the treatment of disease by electricty, *i. e.*, disease polarity. The anabolic processes in the animal economy seem to me to be more prominent than Dr. Morton will admit. Part of the matter taken in by the animal may, by constructive metabolism, be built up into the tissues proper; bone, muscle, and nerve and the tissues of the various organs; another portion may also, after constructive metabolism, be stored up as reserve material in the form of fat and glycogen; while a third portion may, by destructive metabolism, be split up into simpler substances which may be excreted without having entered into the composition of the body. All of these processes are related to oxidation. Mc Kendrick says that it is not improbable that in the first instance constructive metabolism occurs by which the oxygen, proteids, fats, carbo-hydrates, salts, and water are built up into the highly complex matter, living protoplasm, and that thus there is for a short period, a still further conversion of energy into the potential condition ever in the animal. "Contrast now the plant and the animal — the plant transforms kinetic into potential energy, the animal transforms potential into kinetic energy. But neither the plant nor the animal is wholly concerned in the one operation."

It is useless to go into the question of muscular irritability, of stored energy, of rest and motion, because our knowledge of these points is not absolute, and because, too, the subject is far too large to find place in a medical journal. I believe, however, that the general principles enunciated in the paper under discussion will hold for all conditions of muscular irritability and nerve innervation. Starting out with the idea of polarity in disease, I have been using the material at my disposal both in my clinic and private practice as a test, and so far I have not been disappointed. In old inflammatory conditions in any part of the body, the more especially in the cellular tissue around the uterus, in gout and rheumatism, the principle holds good.

Sometimes the plasmatic cells undergo a sort of decay by accumulating fat in their interior, and thus afford adipose tissue; in this condition they are no longer susceptible of undergoing transformation; they are, so to speak, dead. "But most, though changing form and becoming almost mummified (stellate plasmatic cells), preserve, in their latent condition, all their vital characteristics, ready to wake up if the excitation is sufficiently strong; in this way they can furnish new forms, as for instance, cancer, different tumors, and in general, purulent abscess globules. Thus the embryonic cells become pathological." We must acquaint ourselves thoroughly with the pathological processes engendering disease, in order to understand whether such changes are anabolic or katabolic, whether the disease in question is electro-positive or electro-negative, and then if electricity be indicated, there will be no trouble in selecting the proper pole.

Pruritus Ani. — In our June number, page 259, Dr. Dumesnil, of St. Louis, is placed in an awkward position by errors, which have unfortunately crept into a quotation of his writing. We are exceedingly sorry that the mistakes occurred. However, Dr. Dumesnil's reputation is so well established, that we feel no injury will be done him. The extract and perscription should have read as follows: —

PRURITUS ANI. — Dr. Dumesnil, of St. Louis, recommends for this distressing affection, the following mixture: Corrosive sublimate, 1½ gr.; ammonium chloride, 3 gr.; carbolic acid, 1 dr.; glycerine, 2 oz.; aqua rosæ, 6 oz.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE LIVER AS A BILE-MAKING ORGAN.[1]

BY DUJARDIN BEAUMETZ.

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Translated by J. H. Kellogg, M. D.

(Continued from May Number.)

WE have first to examine the biliary passages, then the bile which flows through them. I shall dwell briefly upon the anatomy of the biliary passages, referring you to the special treatises where you will find all the information desired respecting their anatomical disposition.

I wish only to call your attention to the fact that the view supported by Robin and Claude Bernard, that a separation existed between the hepatic lobule and the biliary passages, is no longer admissible. Robin held that the biliary passages terminated in *cul de sacs*, and that the latter were the organs of the secretion of bile, while Bernard thought that the hepatic cell held exclusively the glycogenic function, the bile being secreted by special organs.

It is clearly recognized that the biliary passages are in direct relation with the hepatic lobule, and constitute a perilobular and inter-lobular network which completely envelops the hepatic cell, and it is in this cell that the act of secretion of the bile is performed. These canals, joining larger branches, traverse the liver, enveloped in the capsule of Glisson, then become the extra-hepatic biliary canals which end in the ambule of water. This system is completed by the biliary reservoir of the gall-bladder, which plays so important a role in the pathogeny of biliary calculi.

I should have said nothing respecting the anatomical organization of these extrabiliary canals, the hepatic canal, the cystic canal, and the *ductus collatus communis*, if it were not that several questions of importance might arise for consideration respecting the mechanism of hepatic colic. Struck by the obscurity which existed respecting the pathology of hepatic colic, I undertook, nearly twenty years ago, in 1873, with Audige, a series of experiments upon the production of this painful phenomenon. A complete account of these experiments will be found in a thesis by Audige, dated 1874.

By introducing foreign bodies into the bile ducts of a dog, we reproduced, experimentally, the symptoms of hepatic colic, and we have shown that in this disease there is a reflex spasm of the muscular tunic of these excretory conduits, the spasm developing under the influence of the irritation of the mucous lining of these passages, which possess a high degree of sensibility. It remained, further, for us to be fully convinced of the reality of this spasm, only to ascertain whether in man the biliary conduits possess the same structure as in the dog. In the dog, the muscular layer is very distinct, but in man, in referring to special works on anatomy, I was struck by the divergence which exists in many writers upon this point. Some affirm the existence of a muscular layer; others, upon the contrary, deny it. Grancher and Renault, upon being requested to clear up this question of histology, replied in the affirmative, — that there existed many fibers in the biliary ducts of man, and if I add that this layer appeared notably hypertrophied under the influence of obstacles that obstructed the course of the bile, we have a right to consider hepatic colic as a colic in the sense which general pathology attributes to this word.

We see what conclusions must be drawn from these facts, in reference to the relief of this clinical symptom. It now remains for me to speak of the secretion of bile, and of its composition.

Physiologists are far from being agreed respecting the quantity of bile secreted by man. Relying upon experimental researches, Arnold fixed the quantity of bile secreted daily in the dog, at 8–11 grams per kilogram (about 60–100 grains per pound). Nasse placed the amount at 12–28 grams. These figures are near those of Bidder and Schmidt, which are 13–28 grams; but Kölliker and Muller state the amount to be 32 grams. In their most recent experiments, of which I shall speak later, Prevost and Paul Binet fixed the amount of bile produced each

1 A series of lectures delivered by Prof. Dujardin Beaumetz, published in the *Bulletin General Therapeutique*, and translated expressly for this journal.

twenty-four hours, at 17 grams per kilogram of dog.

Applying these figures to man (a man weighing 60 kilograms), we find the daily amount of bile to be 1000–1500 grams. However, some physiologists affirm, relying upon experiments made upon patients with biliary fistuli, that the quantity does not exceed 700 grams per twenty-four hours for a man of average weight. Others maintain, on the contrary, that the normal amount is three or four thousand grams.

The flow of bile is constant, but there are some circumstances which increase this secretion, — first, the movements of respiration; the layer of the diaphragm compresses the gall-bladder upon the intestinal mass, and tends to empty its contents into the biliary passages; it is a veritable massage of the gall-bladder.

We shall make some applications of this fact when we study the pathogeny and the cure of biliary lithiasis.

While eating, and during intestinal duodenal digestion, the flow of bile is much greater, and during this time, the portion of bile reserved in the gall-bladder is utilized. However, the gall-bladder is not indispensable, it being known, in fact, that certain mammals have no biliary vesicles.

Further, in man deprived of the gall-bladder by a surgical proceeding, or by an invasion of the gall-bladder by calculi, the biliary functions do not appear to be modified.

Many circumstances influence the secretion of bile. I shall not refer to all of these. This would lead me too far; but the point which is of greatest interest in relation to the secretion of bile, is the action of medicines upon this secretion.

It is known that there exists in therapeutics a group of medicines to which has been given the name of cholagogues. These are drugs which have the effect of increasing the biliary secretion.

The study of these drugs is based upon experiments which have assumed, in recent times, great scientific precision. Formerly, experimenters were content to examine the stools or the livers of animals to which certain medicines had been administered. Then Moesler, in 1857, substituted for this primitive proceeding, a method of operating much more precise. Roerhig curarized a dog. Then, after having established artificial respiration, he separated the common bile duct, and introduced into this canal, a narrow tube, really a drop-tube. Then he counted, in a given time, the number of drops which flowed from the tube, and thus determined the action of the medicaments introduced into the chest-tube of the animal under experiment. It should be understood that the cystic canal was carefully ligated.

In 1875, Rutherford and Vignal published their great work upon cholagogic remedies. The method which they employed was very similar to that of Roerhig, only in place of employing a rigid tube, they introduced into the common duct a tube of glass to which was fitted the rubber tube itself, terminating in a glass tube which led into the receptacle which received the bile.

In 1882, we found a work by Rhoman, upon cholagogic medicines. Rhoman employed a biliary fistula. Then came the work of Baldi, in 1883, that of Packe, in 1884, and finally the extremely interesting work of Prevost and Paul Binet, upon which I desire to dwell especially.

The proceeding employed by these Swiss experimenters, was that of the biliary fistula. After having anæsthetized the animal, they ligatured the common duct, and then established a fistula between the gall-bladder and the abdominal wall. This operation made upon the dogs has not disturbed the health of these animals which have been observed during many months. A glass tube is placed in the orifice of the fistula, and the amount of bile which flows in five minutes is carefully calculated.

In other works Rutherford and Vignal have made known to us a series of substances which occupy an important place within the scope of cholagogic medicines. These are, evonymin, phytolaccin, iridin, juglandin, and daptisin, substances upon which my student Davet has written a thesis, and upon which I have long insisted, in my clinical therapeutics.

A certain number of these medicaments have remained in therapeutics, especially evonymin, which to-day is much used in the form of a pill, 10 centigrams each of evonymin and medicinal soap for one pill. One or two of these pills are taken in the evening, on going to bed. Phytolaccin has also been the occasion of a very interesting work of my colleague and friend, Dr. Desnos.

Besides these new studies by Rutherford and Vignal, these experimenters have classed the different medicaments according to their cholagogic action. We are to-day able to compare with the classification made by the English experimenters that which resulted from the researches of Prevost and Paul Binet.

These experimenters have classed in four grades the different substances which they have studied. In the first grade are those which increase the biliary secretion to a certain degree. In the first line are bile and biliary salts; then comes urea, which, it should be remarked, has produced grave gastro-intestinal symptoms following different substances, essence of terebinthine and its derivatives terpinol and terpine, chloride of potash, benzoate and salicylate of soda, salol, evonymin, and muscarine.

The second group comprises drugs producing either only a slight increase in the amount of bile produced, or a doubtful or inconstant result. These are bicarbonate and sulphate of soda, chloride of sodium, Carlsbad salts, propylamine, antipyrine, aloes, cathartic acid, rhubarb, hydrastis canadensis, ipecac, and boldo.

The third group includes substances producing ptomaines in the secretion of the bile. Acholagogues, iodide of potash, calomel, iron, and copper, trapeoline (by subcutaneous injection), strychnine in toxic doses.

Finally, the last group is that which is constituted by substances which have no action upon the biliary secretion. These are, phosphate of soda, bromide of potash, chloride of lithium, sublimate, arsenite of soda, alcohol, ether, glycerine, quinine, caffein, pilo-caffein, kairine, columbo, senna.

These results give rise to numerous reflexions from the therapeutic point of view, as the bile must be considered one of the most powerful of cholagogues.

Before this time, bile had been used in certain hepatic infections complicated with icterus. I have also utilized the cholagogic properties of bile by associating it with oil in the treatment of biliary calculi. Evonymin, which Rutherford placed at the head of cholagogues, along with podophyllon, still retains its first rank, but the most interesting is certainly the result obtained by salicylic compounds. Here is also a confirmation of the experiments of Rutherford, who considered salicylate and benzoate of soda as very powerful cholagogues, and as bile is antiseptic, one understands that this cholagogic action enters somewhat into the remarkable effects obtained by the use of salol and salicylate of bismuth in counteracting intestinal putridity.

Finally, let us remark that terebinthine and terpinol, which were not yet known when the experiments of Rutherford were made, may be arranged among the medicines having an active effect upon the secretion of bile.

The conclusions concerning the second group, that is to say, that which includes substances producing only doubtful, slight, or inconstant increase in the secretions of bile, are also interesting from a therapeutic point of view.

As was remarked by Rutherford, the salts of soda, and in particular the bicarbonate of soda, has very little activity as a cholagogue.

I have already spoken, in my clinical therapeutics, of the contradiction which appears to exist between clinical and experimental researches, in relation to the cholagogic action of bicarbonate of soda waters. I still believe that this action of the waters of Carlsbad and Vichy is not due to a cholagogic effect, but to a modification, a reaction, of the digestive functions, improving the general health and the nutrition.

I should remark that sulphate of soda, which Rutherford indicated as a good cholagogue, is unreliable according to the Swiss experimenters. The same is true respecting the chloride of soda.

Hence the conclusion that the natural salts of Carlsbad, which include chloride of sodium sulphate of soda, and bicarbonate of soda, cannot be arranged among cholagogic substances. I should have remarked respecting aloes, that while Rutherford placed it as one of the best cholagogues, Prevost and Paul Binet consider it as a very unreliable cholagogue.

Finally, I find in these experiments a confirmation of what I have advanced respecting boldo. It was many years ago, in 1876, when I first maintained that this drug was more a diuretic than a hepatic remedy.

The last group, comprising drugs without action upon the biliary secretion, or diminishing this secretion, leads me to speak of calomel. Here again occurs the same divergence between clinical ob-

servations and therapeutic experiments which we have observed respecting the alkaline mineral waters.

If there is any one medicine greatly used in hepatic affections, especially in England, it is calomel, and its favorable action rightfully leads to the consideration of calomel as one of the most powerful cholagogues of which we are possessed.

Rutherford had previously called attention to the diminution of the secretion of bile under the influence of calomel. Prevost and Binet urged the same result. This conformity in their experimental conclusions must therefore lead us to consider calomel as an acholagogic drug. If it has any effect in hepatic disorders, it is probably by quite another action. Calomel is, in fact, a very powerful antiseptic drug, and it is in destroying intestinal putridity that it favorably modifies the functions of the liver. As to the coloration of stools normally, this is not due to the modifications of the bile, but to a coloration produced by the mercurial salt itself.

Although Rutherford maintained that calomel diminishes the secretion of the bile, he has also maintained, on the contrary, that corrosive sublimate augments this secretion, and the conclusion has been drawn that it is therefore necessary to substitute corrosive sublimate for calomel in the treatment of hepatic affections.

According to the experiments of Prevost and Paul Binet, this substitution should not be made, for corrosive sublimate has not produced this cholagogic effect upon their animals.

(To be continued.)

Organic Oxidations in Tissues.— M. Jaquet, of Bâle, recently reported to the Society of Biology, of Paris, the results of a series of researches upon the mechanism of oxidation in the body, which he believes establish the following propositions: —

1. That the blood alone does not possess the faculty of oxidation.

2. That the tissues, or an extract of the tissues, possess active oxidizing powers in the presence of atmospheric oxygen.

3. That this oxidizing property is destroyed by boiling.

In the presence of these facts, one is brought to the conclusion that the principle active cause of the oxidations in the living organism is a soluble ferment or diastase. This ferment plays, in organic oxidations, the same role as heat in ordinary combustions. Its action cannot be distinguished from other catalytic processes, for it acts only in breaking up the molecular union of the atoms of carbon and hydrogen.

Calcareous Food. — In a discussion concerning the value of bromide and chloride of calcium, recently introduced as therapeutic agents by M. G. See, which recently occurred before the Academy of Medicine of Paris, M. Dujardin Beaumetz made the following very pertinent remarks, which agree entirely with the observation of the writer: —

"I wish to return, to-day, to one point of the communication of M. G. See,— that which relates to the necessity of furnishing calcareous elements to those patients in whom, for any reason, these elements are deficient.

"Now it appears from the works of various authors, notably the thesis of M. Chery l'Estage,— that if one wishes to introduce into the stomach of a child or an animal, calcareous substances, it is necessary to employ, not the pharmaceutical substances, but phosphatic substances already assimilated by nature.

"Among the vegetable products which contain the largest amount of calcareous salts, I will mention bran. Bran bread which has been condemned in the army, or for those not suffering from calcareous inanition, is, on the contrary, of the greatest utility to children predisposed to rachitis. The same is true of beans, horse-beans, and lentils. You know that horse-beans are employed in feeding sheep to cause them to assimilate the phosphates of lime, and to give them age by hardening their teeth.

"As to pharmaceutical phosphates, they are not assimilated, and are almost completely eliminated by the urine or fæcal matters. I am astonished, then, that in the communication of M. See, he recommends the administration of the salts of calcium to furnish calcareous elements to the system.

"The improvement which follows the administration of these foods, lacto-phosphates, or of chloro-hydro-phosphates of lime, is due to the happy influence which these drugs exert upon the glands and the digestive tube, and not because they introduce the salts of lime into the system."

Alcoholism and Insanity.— M. Vaillard, the distinguished Professor of Clinical Medicine at the Medical School of Marseilles, France, has recently published a series of lessons (*"Leçons sur l'Alcollisme"*), in which he calls attention to the constantly increasing use of alcoholic drinks in France, and especially in Marseilles. According to the statistics which he gives, the consumption of alcohol in Marseilles has increased from 9700 hectoliters in 1878, to 19,675 hectoliters in 1891, an increase which is vastly out of proportion to the increase of population, it being well known that in France the population has been actually at a standstill until the last year, when there was a marked decrease, owing to the falling off of the birth-rate, for which alcohol, with the use of tobacco, was also shown to be largely responsible.

According to M. Vaillard, 65 per cent of the patients admitted to the Hospital for the Insane, at Marseilles, are chronic inebriates. These facts are certainly very instructive for Americans as well as Frenchman.

The Cure of Consumption. — Dr. Burney Yeo, Professor of Clinical Therapeutics, King's College, London, has great faith in the curability of pulmonary tuberculosis, especially in the early stages of the disease. He calls particular attention to the importance of recognizing the disease in the pre-tuberculous, or the pre-phthisical stage. The symptoms are sufficiently characteristic to render a diagnosis probably, although not positively certain. With Prof. Grancher, he agrees that in the pre-phthisical stage, the symptoms may be nothing more than a little debility, a slight cough, pneumonia, and a slightly quickened respiration. As the disease advances, physical diagnosis may detect in certain private areas a harsh, low-pitched respiration, especially marked during inspiration, jerky, or interrupted inspiration. These symptoms are especially important when distinctly localized and constant. Early hemorrhage is useful in calling attention to the disease before it has reached an incurable stage. The principles upon which the rational treatment of the disease is based, as laid down by Prof. Yeo, may be summed up as follows: —

1. Whatever favors the sclerotic or fibrous evolution of the tubercle promotes the natural condition of cure. The most favorable cases for cure are those in which there is absence of excessive vascular irritability, as shown by flushing on slight provocation and marked vaso-motor disturbances.

2. The constitution in general should be sound, and there should be absence of marked hereditary predisposition.

3. In some cases, probably, the infecting agent is less virulent than in others, and doubtless also, the number of invading germs influence the extent of the infection and the probability of the cure.

4. The mode of infection must also be considered; that if the germs have reached the lymphatic channels or the blood, the wide diffusion of the infection makes an unfavorable prognosis imperative. Infection through the air is much more favorable for recovery.

5. The tuberculous patient must be made to digest as much food as possible. To gain flesh is of the greatest importance.

6. A residence in a pure, dry atmosphere, is one of the most favorable conditions for a cure.

The most valuable remedy thus far discovered, and one most widely used at the present time, and in which the greatest confidence is placed, is creosote used by inhalation, and in large doses by the rectum.

THE CURE OF RABIES BY THE BLOOD SERUM OF IMMUNE ANIMALS.

A RECENT number of the *Annales de Micrographie* contains an interesting article by Tizzoni and Schwarz, of Boulogne, detailing the results of experiments by the authors, for the purpose of determining the value of the blood-serum of animals protected by vaccination against rabies. In the treatment of animals affected by the disease, and in rendering animals immune as regards this affection, they doubtless undertook, by their researches to solve the following problems: —

1. Is the blood of animals vaccinated against rabies capable of destroying *in vitro* the virus of rabies, and if so, what is the substance to which it owes this property?

2. Does the blood act in the living organism in the same manner as *in vitro*, and may it be employed as a means of transmitting immunity from vaccinated animals, to animals not thus protected?

3. Is the blood of vaccinated animals capable of curing the disease during the incubation period of rabies, as well as of conferring immunity?

4. Finally: Is the diffusion in the bodies of animals vaccinated against rabies, of the substance which confers immunity limited to the blood only, or does it extend to the tissues and viscera?

The following are some of the most interesting results and conclusions reached by the experimenters: —

1. The serum of the blood of a rabbit vaccinated against rabies has the power of destroying *in vitro* the virulence of rabic spinal cords.

2. The serum of the blood of dogs possesses this property to a much less extent than does the serum of rabbits.

3. The active principle of the rabic virus is a non-dializable substance which is precipitated by alcohol; the precipitate retaining the activity of the virus, being little affected by the precipitation. The active principle is a proteid substance belonging to the class of globulins.

4. That the blood of animals vaccinated against rabies acts in the organism as *in vitro*, in destroying the rabic virus, and this confers immunity upon animals into which it has been injected.

5. That the serum of the blood of dogs vaccinated against rabies is much less active in conferring immunity than that of rabbits similarly protected by vaccination.

6. That by the injection of the serum of vaccinated animals, a curative as well as a prophylactic action is obtainable.

The general conclusion reached by the experimenters is the following: In rabies, as has been demonstrated for other infections, the beneficial effects of vaccination are due to the presence in the blood of a substance capable of conferring immunity, which comports itself as a globulin, and probably belongs to the class of enzymes. In immunization, whether prophylactic or curative, it is possible to substitute in animals, and probably also in men, for the anti-rabic vaccinations which are practiced at the present day, injections of the serum of the blood of animals vaccinated against rabies, with all the advantages which result from the substitution of an inoffensive substance devoid of virulence, for a virulent substance, the virulence of which has been attenuated by dry heat.

Hæmatotherapy in Tuberculosis. — The remarkable experiments of Drs. Bertin and Picq, in the treatment of pulmonary tuberculosis by the injection of goat's blood have attracted much attention. These experimenters seem to have surrounded their work with every possible precaution, and to have so far as possible avoided sources of error. They have now employed this method in 150 cases with the following results, which we quote from the *Journal D'Hygiene*:—

"At the beginning of the disease the patient's condition is so much improved that a cure may be said to be effected. In the period of softening, very great improvement is often obtained, the cough and expectoration diminishing and the strength returning, even when all the classical modes of treatment have completely failed."

It seems that this method of treatment will probably have a future, and that it will not fall into disrepute so promptly as have many of its predecessors. The recent researches in bacteriology have placed the method upon a sound physiological basis, and there seems to be a good prospect that further study of this new mode of combatting one of the most terrible maladies known to man, will result in establishing it upon a sound therapeutic basis.

Atropine for Hypersecretion of Gastric Juice. — Voinoitch (*Les Nouveaux Remedies*) recommends atropa in doses of $\frac{1}{100}$ of a grain, three times daily, as the best remedy for combatting hypersecretion of the gastric juice (without hyperacidity), basing this use of the remedy named, upon the experimental researches of Netchaeff, upon the inhibitory action of the secretion of the gastric juice. It is claimed that the remedy diminishes the pain, and completely controls the vomiting. An obstinate case was completely cured by the use of the remedy, within ten days.

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

Blennorrhagia.— The *Annales De Micrographie* T. IV, No. 7, 1892, p. 59, gives a digest of M. Wertheim's contribution to the study of blennorrhagia. Concerning the culture of the gonococcus, the following conclusions were arrived at:—

1. The gonococcus may be easily isolated and cultivated on plates, by using blood serum. To give it the property of solidifying, according to M. Hueppe, it is necessary to add sterilized gelose. In three days were obtained thus, pure cultures of gonococcus.

2. The cultures thus obtained, when inoculated in the urethra of man, provoked a typical blennorrhagia, as was demonstrated by five experiments.

3. The possibility of employing plate cultures proves that it is not necessary to sow the matter to be inoculated, in a thick quantity, because each germ gives rise to one colony. The cultures in punctures and in furrows succeeded equally well.

4. The serum of human blood is by far the best field for the gonococcus, still meager cultures are obtained in the serum of animal blood and gelose, even when the blennorrhagic pus is directly sown.

5. The well developed cultures on human serum may be transplanted on fresh serum after four to five weeks, on condition of having been protected against dessication.

6. The virulence is not lost rapidly in artificial culture media. A culture of four weeks of human blood was found still very virulent.

7. The gonococcus develops better, protected from oxygen than it does when exposed to its action. In the experiments made to ascertain whether this germ could produce peritonitis, the experimentalist found that it was capable of producing this disease, but that animals have not all the same receptivity to it. White mice resist the least, then come guinea pigs, then rabbits, and rats. Dogs are almost as a rule refractory. Histological examination of the walls of the abdomen, show that the gonococcus penetrates in epithelium and in the connective tissue, and that it spreads like other pyogenous germs,— by means of the lymphatics.

Behavior of the Typhic Bacillus in the Soil. — Dr. Justin Karlinski has recently made experiments to elucidate the behavior of the typhic bacillus in the soil. In the *Archiv für Hygiene* (XIII. p. 302), the following conclusions were given, a synopsis of which is produced in the *Annales De Micrographie* (IV. No. 7, p. 354):—

1. In the experiments made, the typhic bacillus remained alive in the soil three months at the most.

2. The duration of the life of the typhic bacilli buried with dejections in the soil and abandoned, in their normal condition is notably less than that of the bacilli withdrawn from the blood and buried in the soil in the state of pure culture, which probably comes from the antagonism that is made to the former by the various bacteria of fæces.

3. In the deep layers of the soil, the typhic bacilli may resist the changes of temperature and humidity as well as the action of the micro-organisms of the soil.

4. At the surface of the soil, exposed to dampness and the sun, they perish rapidly.

5. Frequent intermissions in the dampness of the soil, when at the same time this moisture reaches a considerable degree, diminish notably the duration of the life of the typhic bacilli, either by being affected by humidity from above or touched from beneath.

6. In the portions of soils where the roots of plants penetrate, duration of their life is very short.

7. During the putrefaction of the organs of typhic cadavers a notable elevation of temperature exists.

8. In the organs of typhic cadavers buried in the soil, the typhic bacilli may, when putrefaction is retarded, and the access of this specific organism of putrefaction meets obstacles, be found still alive after three months.

The Pure Cultivation of Actinomycosis and its Transmissability to Man. — Most of the experiments which have been made to date on the subject of the actinomycosis have not been satis-

factory. The results have been discordant, and few men have been able to show with any degree of justification that their attempts at cultivation were reliable. Prof. Max Wolff and Dr. James Israel (in *Virchow's Archiv*, No. 106, p. 11) report more extensive labor and investigations of this parasite than ever were made before and their endeavors seem to be more fruitful than those of any of their predecessors.

The origin of their experiment was two cases of human actinomycosis. In both cases they succeeded in cultivating the micro-organism of this disease in a state of purity on agar-agar, at 37° C., and protected from the air. The growth of these organisms was the result of the inoculation of the well-known granules found in these specific tumors. They succeeded in cultivating them also on fresh eggs, or eggs cooked from three to four minutes. These granules, if well triturated on the surface of the agar-agar, produce little granulous spots, hyalin first in appearance, then opaque in the interior and around the triturated mass.

In order to obtain these results, the matter inoculated must be well spread, otherwise the growth appears as a gradually-forming, whitish areola. In the cultures made by piercing the medium the latter becomes turbid and soon presents several small granulations. In transferring this first culture to the surface of fresh agar-agar, there appears between the third and fifth day some fine granulations resembling minute drops of water or dew drops (not larger than the head of a pin). These drops coalesce and form a uniform surface if the virus has not been thoroughly and thinly spread. Generally, however, it is not a true coalescence, as may be seen with a magnifying glass, but a close aggregation of droplets. A number of other peculiarities are observed by the author, but the above are the most characteristic. It is well to know, however, that the confluent minute drops produce a whitish scum in which it is impossible to distinguish any granulation except at the margin. Among granulations formed, there are sometimes a few large white ones which usually send ramifications to the interior of the agar-agar. The authors state that the organism is anaërobic, though it is not essentially so, for it does not demand the total absence of oxygen ; but in cultures exposed in the air it grows better in the bottom of the puncture made in the medium. It can be cultivated in alkaline broth in which the growth appears as fine scales gradually falling to the bottom without rendering the liquid turbid. It does not grow in gelatine at the usual temperature.

The miscroscopic appearances described are varied ; there may be found rod-shaped organisms, filaments with or without bifurcation, straight or undulated ; and on the other hand, there may be present spiral forms and organisms of the coccus family ; besides this there were seen in egg cultures a network of filaments such as are seen in human actinomycosis. About the margin are found occasionally some filaments with swelled extremities.

The cocci are sometimes sequestered, but usually they are in the rods and filaments, and may be stained by Gram's method. The authors do not consider these round forms as spores, because they take stain too easily. It will be remembered that Boström, who claims to have cultivated the actinomyces, considers the round bodies as spores. The club forms which are typical of parasites in tumors, do not appear in culture.

Inoculation experiments were made on twenty-three animals, one of which was a subject of control. Of the animals inoculated with pure cultures eighteen were rabbits, three guinea pigs, and one a sheep. In most of them it was done in the peritoneal cavity. The development of actimomycosis occurred in every instance except in the sheep. The tumors were revealed in post-mortem examination after four to seven weeks from the date of inoculation. The tumors were usually on the peritoneum. One affected also the muscles of the abdominal wall. Four animals kept alive for a long time, developed tumors that could be felt by palpation from about the seventh to the ninth month after the infection. Small tumors from about the size of a lentil to that of a plum were found in the tissue covering the abdominal wall, the intestines, the mesentery, the liver, and other organs. In all these tumors microscopical examination demonstrated the typical granules of the disease. In cultivating these it was possible to obtain the actinomyces in a state of purity. The authors think the organism is a bacteria and not a fungus.

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A NEW FORM OF ELECTRICAL CURRENT.

M. A. D'ARSONVAL, assistant to the eminent Prof. Brown-Sequard, of Paris, has, within the last year, published the results of some very interesting and remarkable studies upon the physiological effects of various forms of electricity. In the course of his studies, he has investigated the nature of the current produced by various forms of induction apparatus, making a careful comparison between the different currents produced by graphic means. The accompanying tracings represent (1) the curve obtained from a magneto-electric machine (Clark's) commonly used for medical purposes in France, and (2) the second tracing represents the curve obtained upon apparatus designed by D'Arsonval and constructed by Gaiffe, of Paris. The curves show clearly a remarkable difference in the currents produced by these two machines. That produced by the first machine is irregular, while the current of the second machine, although alternating, is smooth and uniform, there being no sudden break or interruption of the current, but an alternate swelling and diminution in opposite directions, the change in interruption being effected at the instant when the zero point is reached. The smooth, alternating current produced by the machine of D'Arsonval has been termed by him "*voltaisation sinusoidale.*"

The properties of this current are thus stated by D'Arsonval in a report made to the Academy of Sciences at its session of June 27, 1892 (reported in *La Semaine Medicale*), as follows: —

"In a previous communication, I have indicated a general method for obtaining by synthesis the form of the electrical wave used to excite a living tissue. This curve which I have called the 'characteristic of excitation,' shows the electric excitant from a physical point of view, and enables us to employ it always in identical conditions. The numerous experiments which I have made by the aid of this method, have enabled me to formulate the following law in a simple case, such as one of uni-polar excitation: *The intensity of the motor, or sensory, reaction is proportionate to the variation of the potential at the point excited.* Since then, I have conducted a special study from a practical medical point of view, of the electrical effects produced by alternating currents with sinusoidal variations, and I have established the following facts: —

"1. By regulating the sinusoidal apparatus, one may pass through the body currents of great intensity without producing either pain, muscular contraction, or chemical action. This absence of physiological action is, however, only apparent, for an analysis of the air of respiration shows that the passage of this current is accompanied by an increase in the absorption of oxygen, and in the elimination of carbonic acid gas.

"2. By gradually increasing the frequency of the alternations, energetic muscular contractions may be induced, but the contractions are infinitely less painful for equal intensity than when an induction coil is used. In these conditions, respiratory combustion is considerably increased, and these currents act powerfully in modifying nutrition."

The writer has been specially interested in these researches of Dr. D'Arsonval, on account of an interesting observation first made in 1883, when experimenting with electrical currents upon

different forms of apparatus. Among other electrical machines employed, was a small magneto-electrical apparatus, commonly known to electricians as a telephone generator, and used in central telephone stations for generating currents to ring the bells in the circuit. It was found that this machine possessed the peculiar property of being able to produce powerful but painless muscular contractions. The writer has had one or more of these machines in use in the Sanitarium under his charge, since the date referred to, and described the machine, together with some of the peculiar properties of the current produced by it, in a paper read before the Am. Med. Association and has, in all, made several thousand applications of the current under various conditions. The machine has been exhibited, and its peculiar properties demonstrated to many physicians, among others, Dr. E. Betton Massey, of Philadelphia, who, like others, was at a loss to understand the peculiar painlessness of applications of this current, notwithstanding the remarkably vigorous and widely extended muscular action produced by it.

In the *Archives de Physiologie*, January No., 1892, Dr. D'Arsonval published the curves which we present below, which led the writer to undertake a similar current produced by the telephone generator, and with the result of obtaining the following curve by means of the galvanometer of D'Arsonval, and the kimographion.

A comparison of this curve (Fig. 3) with that produced by the sinusoidal machine of D'Arsonval (Fig. 2), shows at once that the two currents are identical in character.

We are now engaged in a series of experiments for the purpose of determining the physiological effects of the current, which we have no doubt will coincide with those obtained by D'Arsonval with his machine. We have found it advantageous to modify the machine as recently reconstructed, by re-winding the armature with coarser wire, thus producing a greater quantity of current with a somewhat diminished intensity. As originally constructed, the machine was capable of maintaining a current of one ampere over a circuit presenting a resistance of 20,000 ohms.

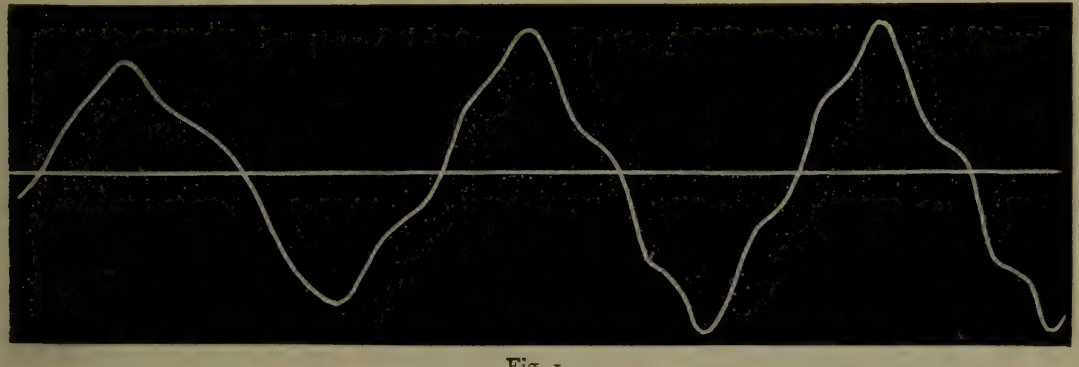


Fig. 1.

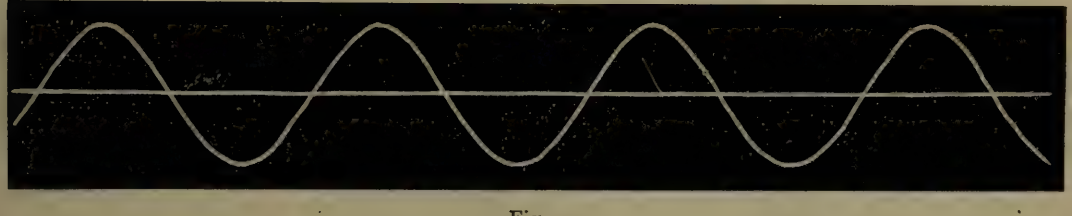


Fig. 2.

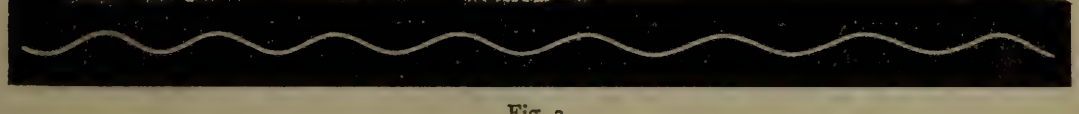


Fig. 3

The electro-motor force, is, of course, diminished by re-winding with a coarser wire, but we find the current produced by the change better adapted for therapeutic applications to the human body.

J. H. K.

PUTREFACTIVE GERMS IN HEALTHY MEAT.

THE exceedingly interesting culture experiments by Segri Trombetta, an account of which appears in another department of this journal, bring into clear view facts of very great importance from a dietetic standpoint. These experiments show that within sixteen or seventeen hours after death, at ordinary temperature, and within twenty-four hours after death, at the temperature of an ice-chest, putrefactive processes are already established in various parts of the bodies of rabbits and other animals. The experiments have relation to aërobic germs, the pathological significance of which are well understood. When it is considered that a great share of the flesh of domestic animals consumed as food, is kept for some days after the animal is killed,—usually eight or ten days, and in some instances, so long as two or three months,—the important relation of this putrefactive process to the dietetic value of flesh food must be appreciated.

Bouchard has shown that meat juice extracted from flesh in which a putrefactive process is going on, possesses decidedly toxic properties, and that the degree of toxicity is directly proportionate to the length of time during which the putrefactive process has been in operation. It becomes evident, then, that the use of flesh food more or less heavily charged with the toxic products of putrefactive micro-organisms must be a source of injury to the vital economy. That we are not sensible of the influence of poison on every occasion when such food is used, is solely due to the fact that the liver is endowed with functions which enable it to counteract the influence of organic poisons by oxidizing them, or in some other way diminishing their activity. Nevertheless, it must be apparent that the imposition of a great amount of this unnecessary work upon the liver will result in an interference with the performance by this important organ, of its natural and legitimate functions; consequently its work of eliminating the natural poisons of the body, in the production of bile, as well as its glycogenic functions, must be more or less impaired. Is it not possible that this is the source of quite a large proportion of the cases of inactive liver, biliousness, and kindred morbid states which constitute so large a share of the functional disturbances with which every physician is called upon to deal?

The common practice, especially in England and France, which allows the process of decomposition to advance so far as to give to the flesh the term *haut gout*, must be recognized as not only unwholesome but positively dangerous. In the light of the researches referred to in this article, it is no wonder that persons addicted to the use of such food, which includes in this country a large portion of the flesh consumed as "game," are subject to frequent attacks of biliousness, sick headaches, "running off at the bowels," and other conditions indicative of poisoning. The marvel rather is that such persons do not suffer more seriously than they do, and that attacks of fatal poisoning from such sources are not more frequent. The fact that fatal results do not frequently occur, must not be considered, however, as an evidence of the innocuousness of such a diet.

The evil results of such transgressions of the laws of health, are most often recognized, not in directly fatal consequences, but in indirect ways; for example, the man who uses up his liver energy in the consumption of ptomaines taken in with his food, has but little liver capacity upon which to fall back in case

of a fatal emergency arising from exposure to malaria or micro-organisms, the reception of which the system is not able to avoid. One cannot always select to his satisfaction the air which he inhales into his lungs, or even control to a nicety the character of the water which he drinks; but he can, if he will, at least under any but the most extraordinary circumstances, avoid the dietetic use of ptomaines in the form of putrefying meat.

In view of these facts, as above stated, it seems very clear that every State Legislature would be amply justified in the passage of a law prohibiting the sale of undrawn fowls or other small animals which are always in a state of advanced decomposition when offered for sale in the public markets, as evidenced by the greenish color of the flesh, especially in the abdominal region. J. H. K.

MIXED DRUGS IN THERAPEUTICS.

As the progress of medicine reveals the contrast between the medical practice of the past and that of to-day, and also between the practice of the easy, indolent physician and the progressive one, we are sometimes amazed at the combination of drugs once used, and in some instances still made use of. A prescription containing from a half dozen to a dozen ingredients was not uncommon, and still finds favor among many. The idea seems to be that, in putting up such remedies, one or two medicines are mingled for each symptom noticed in the patient, in order to hit the disease somehow. That such methods should have been in vogue years ago is but natural when we consider the meager knowledge upon which therapeutics was then based, but that such practices should prevail to-day, is a reflection upon the intelligence and the industry of those who favor them. Physiological chemistry has advanced so much during the last ten or twenty years, that we are bound to recognize a principle in the administration of drugs which should ever be consulted in the practice of medicine, and that is *the chemical action* or *actions* which may take place in combining various drugs (even those of purely vegetable extraction), and the chemical action or actions which may take place between these drugs and the natural secretions of organs, and the substances of the cells of the organs themselves, with which they come in contact in the very structure of tissues, by means of the circulation. It is a fact that we do not know positively the effect of any combination of drugs when once introduced into the system. We have a general idea that such and such a remedy produces such and such a general or special effect, but we do not know satisfactorily — in fact often ignore entirely, the immediate chemical action that takes place to produce the effect; and when these drugs are mingled, and chemical alterations take place between them, we know still less what effects may be produced on the tissues and their natural products and functions.

In view of these facts, it is worse than folly, it is really wrong to make so-called "shotgun" prescriptions, and drug our patients with them. The medical profession is recognizing that medicines do not cure, and that they are given only for the immediate purpose of allowing nature an opportunity to resume her normal work, and thus perform the cure of the malady. P. P.

How the Bacillus Coli Communis Invades the Organism.— In our June number, page 273, six lines from the bottom, M. Roux, of the Pasteur Institute, is mentioned as one of the teachers that the coli bacillus may be transformed into the typhus bacillus. A friend writes us (and we have verified it) that this is an error, that Dr. E. Roux of the Pasteur Institute, is not the man, but that it is M. Gabriel Roux, of Lyons, who is the supporter of this theory. We hasten to make the correction. P. P.

BROWN-SEQUARD'S EXTRACT OF THE SEXUAL GLANDS.

M. Brown-Sequard, who still maintains the efficiency of the injection of the extract of the sexual glands, to which he called attention three years ago, recently communicated to the Academy of Sciences a paper upon the subject, giving further facts in support of his theory.

Prof. Brown-Sequard has maintained that the sexual glands furnish to the blood some useful, if not essential principles, and that the reason for the feebleness of old age is to be found in the senile state of the sexual organs, in consequence of which they are not able to maintain physical vigor. He now believes that the testicles and ovaries have three distinct uses in the organism : —

1. Functions in connection with generation.

2. An influence upon the nerve-centers, through the absorption of their secretions, which give to men and women the physical, moral, and intellectual characters which belong to them individually.

3. A special tonic action which energizes certain functions of the spinal cord and of the brain.

A number of cases are cited which indicate remarkable effects from these injections, in one of the most marked of which, precautions were taken to prevent the experiment from being complicated with auto-suggestion, as a source of error.

This novel therapeutic means fell so short of the expectations created by the first announcements of Brown-Sequard, that it has been practically abandoned by practitioners as being of no value.

But if the experiments of Brown-Sequard have not resulted in giving the profession a therapeutic means of great value, they have at least called attention to facts which indicate very clearly the enormous injury which must result from undue exercise of the sexual functions, and show very clearly, not only the absolute safety, but the positive advantages of a life of continence, thus leaving no longer any excuse whatever for those physicians who sometimes cater to the morbid propensities of young men, in advising, or at least sanctioning, the illegitimate exercise of the sexual functions.

The only possible danger hinted at by Brown-Sequard in a life of continence is to be found in the super-excitation resulting from the absorption of the secretions of the sexual glands; but, for any possible danger which might result from such a cause, an ample safeguard is afforded in physical work. Muscular exercise is, in more ways than one, a vital regulator of the highest value. Excess of food, the damaging influence of a sedentary life, and the hypothetical physical evils of a life of continence, may all be admirably counteracted by a proper exercise of the muscles. But the loss sustained by excessive exercise of the sexual functions is one which cannot be easily repaired.

The tendency to over-indulgence in this direction is exceedingly prevalent among civilized people, and doubtless is the result of excessive alimentation, the use of dietetic and other stimulants, and various social causes. The enormous waste of energy arising from these sources, is doubtless one of the great causes of the rapid physical deterioration of the race, which is easily recognizable even within the last century, notwithstanding the considerable increase in average longevity. J. H. K.

The Opium Habit in India.— The whole civilized world has for many years been pointing with scorn at the British Government for its conduct in relation to the opium traffic with China, but the punishment of this national sin is now being administered in the great spread of the opium habit in India and Burmah, and the consequent deterioration of the native races of these countries.

The evils arising from the opium habit have finally become so great that a commission was appointed two years ago by the British government, as the result of a petition addressed to Parliament by the Society for the Supression of the Opium Traffic. This Commission has recently made its report, which is an occasion for still greater astonishment, and will be, if possible, an even greater discredit to Great Britain, if the report receives the sanction of Parliament, than was the course pursued by that government toward the Chinese many years ago, in forcing opium upon them in opposition to the protective means widely introduced by the Chinese government. Sir Alex. Mackenzie and other members of the Commission, declare that the suppression of the opium traffic is impossible, with a population of 220,000,000 people to control. The Commission also makes the astonishing assertion that the Chinese and others consume great quantities of opium without damage, and "with beneficial results!" Evidently a commission for the investigation of a humanitarian question like this, should have other than a political basis. Further comment is unnecessary. J. H. K.

The Decline of Antipyrine.— When first introduced to the medical profession, antipyrine was specially commended as a means of reducing temperature in febrile conditions. That the thermometer indicated a distinct decline in temperature after the use of this agent, was received as an evidence of its value as an antipyretic remedy.

Further experience, however, has not fulfilled the expectations which were raised concerning the value of this drug.

It has been found that while it reduces temperature, it at the same time often brings the patient into a state of almost complete collapse. Careful physiological experiments have shown that the drug does not diminish temperature by decreasing heat-production, but by increasing heat-elimination, and that in small doses it actually stimulates heat production. It is certainly not an over-statement of the fact to say that the majority of the leaders in therapeutics have abandoned the use of this drug, in favor of other less dangerous means.

In the treatment of cases of poison by antipyrine which have been reported, it is clearly shown that the drug is a toxic agent of great power. The majority of judicious practitioners who have had experience with the drug, will quite agree with Prof. Thompson, of New York, who, in an excellent clinical article on the "Reduction of Temperature in Typhoid Fever," which appears in the fourth volume of "International Clinics," warns against the use of antipyrine, and favors the employment of hydropathic means.

Dr. Sidney Coupland, in an article on "Cerebral Rheumatism," in the same work, points out the uselessness of all antipyretics. He recommends the employment of cold, externally applied, as the best means of reducing hyperpyrexia. J. H. K.

Prize Essay on Quackery. — Dr. George M. Gould, of Philadelphia, has written a most excellent paper on the subject of quackery, entitled "Etiology, Diagnosis, and Treatment of the Prevalent Epidemic of Quackery," in which are said many things which ought to be read by the laity as well as the profession. There is great need for the education of the public in medical matters, to a sufficient extent to enable intelligent people to discriminate between the honest and scientific physician and the charlatan. Dr. Gould is doing good missionary work in this direction, and proposes to do more, and to stimulate others to do likewise, offers a prize of $100 for an essay. He proposes a number of subjects for missionary tracts to be distributed among the people, among which are,

"The Patent-Medicine Evil, "Reasons why Physicians do not Advertise," "Reasons why Physicians do not Patent Instruments, Drugs, etc." Further particulars can be obtained from the author, George M. Gould, M. D., 1004, Walnut St., Philadelphia, Pa.

Dr. Gould very well says: "What a disgrace that patent-medicine syndicates can draw many millions every year from the diseased, deluded, and poverty-stricken of our people with a governmental tax of only 25 per cent upon their mixtures, while the same people must pay a tax of 60 per cent upon microscopes, and one of 49½ cents per pound and 60 per cent beside, upon woolen clothing!"

J. H. K.

REVIEWS.

Essentials of Medical Electricity. — By D. D. Stewart, M. D., and E. S. Lawrence, M. D. Illustrated. W. B. Saunders, Philadelphia, Publisher.

This compendium is a publication that the profession needs. Few know enough about the subject of medical electricity to utilize it in practice. This volume is an exposition that fills the want; it ought to be in the hands of every student and doctor, if for no other purpose than to infuse more knowledge on the subject of which it treats. Price $1.

The Modern Treatment of Hip Disease. — By C. F. Stillman, M. D. George S. Davis, Detroit, Mich., Publisher.

This is a brief, and yet very full review of the modern methods of treating hip-joint disease. It gives no less than 16 special modes, nearly all of which are well illustrated. Mr. Davis is rendering the profession a real service in putting before its members at such a low price, such authoritative and excellent works as this and many other recent publications of the "Leisure Library" series. Price, 25c.

Medical Diagnosis. — By Prof. Oswald Vrerordt, M. D., Heidelberg, Germany. Translated by Francis H. Stewart, A. M., M. D., New York. W. B. Saunders, Philadelphia, Publisher.

We never had the pleasure of reviewing a more thorough, comprehensive, systematic, and complete book than this one. The numerous elegant illustrations are very practical, and the text is clear and concise. Members of the profession unacquainted with German, and who cannot therefore avail themselves of the original edition, owe the translator and publishers a debt of gratitude for their production. We are sure that, as the rare merits of this excellent work become known, this debt will be fully paid in a substantial manner. It is difficult to imagine a book superior to this in assisting in the diagnosis of any disease to which man is susceptible. Price, net, cloth, $4; sheep, $5.

The Hygiene of Consumption. — By W. John Harris, M. D. In our review of this work in this journal for May, we are made to say (p. 246, 2nd column, beginning with the 8th line): "Dr. Harris *firstly* points out the various conditions preparing the field for the germs to grow; but he should lay equal stress on the fact that this plant *will grow*, if the germ is not present." The words in Italics should read "justly" instead of "firstly," and "will *not* grow," instead of "will grow."

Varieties of the Hymen. — By E. S. McKee, M. D., Cincinnati, Ohio An interesting little reprint which tersely describes and illustrates by means of cuts, nine different varieties of hymen. The profession is indebted to Dr. McKee for his painstaking research upon this subject, the value of which we are glad to see is recognized abroad in the reproduction of the cuts and descriptive matter by Prof. A. Martin, of Berlin, in his "Diseases of Women."



WHERE TO SPEND THE SUMMER

AT this Season of the Year, thousands of Invalids are seriously considering the question,—

Where Can I Spend the Months of July and August, and part of September, with the Greatest Profit and Satisfaction?

THE ANSWER to this question depends on what the individual wishes to accomplish by a summer vacation. If change and recreation only are desired, these can be found in a thousand places—at health and other resorts which abound in almost every State in the Union, none of which, however, excel the delightful resorts of northern Michigan.

If, in addition to rest and recuperation, the invalid needs a careful study of his diseased conditions, and an intelligent regulation of diet, exercise, and all other health conditions,—in other words, scientific health culture, efficiently carried out by the aid of the best known medical means and appliances, thoroughly trained nurses and attendants, and competent physicians,—then the choice between the most desirable places becomes very much restricted. There are certainly few institutions in this country where the needs and desires of an earnest health-seeking invalid can

be satisfactorily met. Such places can be counted on the fingers of one hand, and are, perhaps, little known because of the fact that the managers of such institutions are conducting them in a scientific, and in some instances a philanthropic spirit, and consequently do not employ as a means of winning patronage, the emblazoned advertisements, the truth-sacrificing circulars, and other advertising methods commonly resorted to by the proprietors of mineral springs establishments, bogus sanitariums, and other so-called "health institutions" and quasi-medical establishments, with which the country abounds.

The advertisements of these establishments do not appear in public prints or popular magazines because such advertising is closely akin to quackery, and brings those who employ it into bad company.

The managers of the Sanitarium at Battle Creek, Michigan, many years ago undertook to organize a thoroughly scientific institution which would represent rational medicine in its most advanced form, and would be exactly what it professed to be — an institution where patients are honestly and fairly dealt with, treated at reasonable rates, given kind attention and comfort, and opportunity for the recovery of health under the most favorable conditions. The majority of patients treated in this institution are sent to it by physicians who by personal acquaintance, or through the reports of their patients, have become thoroughly familiar with the character of the institution and its management.

BRIEF DESCRIPTION OF THE SANITARIUM.

BATTLE CREEK, one of the most beautiful and prosperous cities of Michigan, is centrally located in the salubrious Peninsular State. Its population is 20,000, while its death rate is but seven per thousand. Battle Creek is situated on two great thoroughfares of railway travel between the East and the West, being at the junction of the Grand Trunk and the Michigan Central lines; and two other railways make it easy of access from the South.

The city has an electric railway and is lighted by electric lights. A great number of pleasant drives are afforded by its well-kept and shaded streets.

The Buildings are lighted by a 700-light plant, Edison incandescent system.

Safety Hydraulic Elevators. Outside stairways for fire escapes accessible from every window.

The Institution affords facilities for baths of every description: Turkish, Russian, vapor, electric, water baths of all kinds, and the electric light bath. Independent accommodations for ladies and gentlemen, sufficient for 80 persons at one time. More than 800 feet of glass for sun-baths.

A General Parlor, 40 x 50 feet, is luxuriously furnished with Dhagistan rugs, easy chairs, etc. The Dining-Room has a seating capacity of 400, is beautifully lighted and ventilated, and always cheerful. No kitchen smells. Cuisine unsurpassed; table service excellent. Everything an invalid needs, and special dietaries prepared as directed.



VIEW OF GOGUAC LAKE FROM SANITARIUM LAKESIDE GROUNDS.

The Gymnasium, 85 x 45 feet, is supplied with every appliance for exercise, and furnishes special instruction and class drills in Delsarte and Swedish gymnastics, under a trained director. Exercise by prescription.

The Swedish Movement Department, both manual and mechanical, is the most extensive in the United States. Vibrating bars and seats, kneaders, rubbers, beaters, shakers, and manipulating appliances of all sorts.

The Electrical Department contains every improved appliance for medical applications of electricity, Galvanic, Faradic, Dynamic, and Static electrical apparatus and appliances for electrolysis, electro-cautery, etc.

An Aseptic Maternity on the cottage plan (steam heat and thorough ventilation), provides the best possible conditions for lying-in patients, with experienced professional attendance and rigorous aseptic management.

Special Departments for surgical cases, eye, ear, throat, and lung diseases, nervous diseases, genito-urinary diseases of men (non-specific), opium and alcohol habits, and diseases of women. A kindergarten and nursery, to keep the children happy and out of mischief.



SUMMER HOUSE AND FRESH-AIR INLET.

Three Fine Greenhouses, maintaining a magnificent collection of palms and various tropical flowers and plants, keep the house filled with bloom during the winter season. Flowers are everywhere indoors during the winter season. Patients can visit the greenhouse at any time without going out of doors.

Glass-Inclosed Sun-Parlors and Verandas for winter sunning and promenading.

Pure Water from sandstone rock.

There are from 250 to 300 Employes in the Sanitarium service the year round, of whom from 90 to 100 are medical attendants and nurses. Also seven thoroughly trained physicians, and a large corps of manipulators skilled in massage and the Ling system of Swedish movements.

The Sanitarium Training-School, in which our nurses are trained, is the largest and most popular in the United States. Its course of training is the most complete and thorough of any school.

Tri-Weekly Lectures on popular medical subjects by the physicians.

Abundant Means for Recreation indoors during inclement weather. Facilities for walking, driving, and horseback riding at all seasons.



ON THE LAWN.

The Sanitarium is Not a Pleasure Resort nor a fashionable hotel, but an ideal place for invalids needing good nursing, the benefits of regular habits and scientific professional care and treatment, and who desire to get permanently well.

The Sanitarium Nursery and Kindergarten. This enables mothers to bring little ones with them without being burdened with their care and supervision. The children have the advantages of kind and experienced teachers and ample playgrounds.

For Further Particulars, see large circular and card of rates.

J. H. KELLOGG, M. D., SUPT.,

Sanitarium, BATTLE CREEK, MICH.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., JULY, 1892.

THE VITALITY OF THE PNEUMOCOCCUS.

M. BORDONI UFFREDUZZI, not long since, made some experiments concerning the resistance of Frenkel's pneumococcus when exposed to diffused sunlight. The writer[1] has undertaken experiments in the same line, which he will now present. Eight series of experiments were made, as follows:—

A. Fresh sputum was exposed outdoors on a piece of sterile cotton cloth, winter temperature about freezing; sunlight about half the day.

B. Dried sputum (dried in a watch glass in the laboratory), exposed outdoors under the same conditions as in A.

C. Fresh sputum exposed in semi-darkness in a hall-way in private residence, on a piece of cotton cloth.

D. Dried sputum exposed in the same place, and under same conditions.

E. Fresh sputum mixed in soil (earth), non-sterilized, exposed outdoors at summer temperature, sunlight half the day.

F. Dried sputum exposed as the preceding specimen, under same conditions.

G. Fresh sputum in earth, sterilized, exposed outdoors in a place shaded half the day, summer temperature.

H. Dried sputum in earth, sterilized, exposed as the preceding specimen.

These specimens had been analyzed and tested, and found to contain virulent microbes of pneumonia.

The *fresh* specimens of A remained virulent sixteen hours. Six rabbits inoculated, one after the first, one after the second, one after third, one after the sixth, one after the twelth, one after the sixteenth hour, died with a specific septicæmia, which the pneumococcus causes in rabbits. Three rabbits inoculated after the sixteenth hour resisted, though one was ill for a few days.

The *dried* sputum mentioned in B, and exposed to sunlight, freezing temperature, as the preceding, remained virulent twenty-two hours. Of a series of six rabbits, inoculated between the first and twenty-second hour, five died of the characteristic septicæmia that the germ of pneumonia produces. The other was ill but recovered. Two rabbits inoculated after the twenty-second hour remained apparently well. One showed a slight malaise.

In experiment C the fresh sputum was protected from the influence of light and cold temperature, being placed in a hall in semi-darkness, where no direct light penetrated. The virus retained its virulence for sixty-one days, and killed between the first and sixty-first day (the last inoculation being on the last day) eight rabbits of ten inoculated. The other two were ill some days. A rabbit inoculated on the sixty-third, and another on the sixty-fourth day were very slightly indisposed, but lived. Two inoculated still later remained well.

Some sputum dried as explained in experiment D, and exposed to the same influences, remained virulent three months, *i. e.*, about ninety-one days. It killed, during that time, by septicæmia, four rabbits each week, the last one being inoculated on the ninetieth day, and remaining ill six days, when death followed. Three rabbits inoculated after the ninety-first day remained well. The temperature of the hall-way in the experiments C and D, averaged about 70° F., never being very warm, and never cold.

In experiment E, the object was to find how long the virus remained alive and dangerous in or upon the earth or soil. As is explained in the beginning of this article, the experiment was made with fresh sputum mixed with non-sterilized earth. It was in summer time, and was kept outdoors where sunlight reached it about half the day, being in shade the rest of the time. The result was that the pneumococcus remained virulent sixteen hours. Of four rabbits inoculated between the first and sixteenth hour, two died; two were ill, and recovered after five days; one, inoculated on the fifteenth hour, remained ill eight days but recovered. After this, inoculation produced no effect.

[1] P. Paquin.

In experiment F, where the same kind of sputum, but dried, was used under the same circumstances and under the same conditions, the virus was preserved twenty-eight hours, three rabbits being killed in the interval, the last of these inoculations being on the twenty-eighth hour, and the subject remaining sick four days before death took place. Inoculation later produced no effect.

It is well to note here that during the time of exposure of this virus, E and F, in earth in a shallow dish, there was no rain and no moisture, except that pruduced during night. The quantity and condition of earth, however, was such that the virus was practically in the same condition that it would have been if sputum had been exposed in the road-way. It was difficult in this case to determine conclusively whether the germs of pneumonia also acted or not, for they were mixed with germs of the soil, and complications arose in several cases after the inoculations. However, in each experiment, the specific diplococcus was found in some of the inoculated subjects, and pure cultures were made from the earth, during the growth of which isolation of the proper germs was possible.

In experiment G, specific virus was mixed with sterilized earth, moistened with sterilized water, and put outdoors under the conditions and circumstances explained for experiments E and F. The result was that the virus was still alive and virulent after twenty-six hours. One rabbit, inoculated just before the twenty-sixth hour, died; another, inoculated afterward (on the twenty-seventh hour), was apparently not ill.

In experiment H, dried sputum of the same kind as that in experiment G, was mixed with earth, sterilized, and placed under the same conditions, and lived thirty-six hours, killing two rabbits before that time, but producing no perceptible effect afterward.

Experiments I and J, which are not mentioned in the beginning of this article, were practically the same as those of E and F, and G and H, the only difference being that the earth containing the virus was kept in a *shady place* all the time, free as the others, from extraordinary moisture. In this condition the virus remained alive in non-sterilized earth several hours longer than the virus mentioned in E and F, and in sterilized earth remained also several hours longer than in the experiment in sterilized earth mentioned in G and H.

It may be concluded, *First*, that sputum dried before being exposed remains virulent longer than fresh virus placed under the same conditions.

Second; that sunlight, as stated by Uffreduzzi, quickly destroys the pneumococcus, and that diffused light modifies it also.

Third; that this germ keeps its virulence longer in a shady or semi-dark place.

Fourth; that in non-sterilized earth it dies quicker than in sterilized earth, possibly through the influence of other germs.

LIVER FLUKES IN CATTLE.

Among the most important investigations made in the last two years, in this country, concerning diseases that are of great interest in hygiene of man or beast, is that made by Dr. M. Francis, of the Texas Agricultural Experiment Station. This expert had, for three years previous to the publication of Bulletin No. 11 of this institution, made very careful investigation of the liver diseases of cattle in Texas, whence comes so much of our market supplies in the West. He has made the discovery of a new parasite in the liver. Not only did he find many cattle affected with the common flukes (*distomum hepaticum*), but he has found a new species, to which he gives the name of *distomum Texanicum*.

In reference to the health of mankind, the investigations of Dr. Francis, and the results obtained, are of a great deal of importance. The liver of cattle is an article of food found in every market, and there is practically no restriction on the sale of animal organs affected with any disease not glaringly obnoxious, for the inspectors of meats are not competent, as a rule, to judge of the safety or purity of flesh which, on the surface, may not offer anything extraordinary in appearance, and may not suggest anything serious from a pathological standpoint. I have seen several specimens of liver of cattle in which *distomum hepaticum* existed, without being able to say positively from external appearance, what existed within. The transformations that take place in any such disease, though there may not be any severe poisons generated by the parasite, constitute, nevertheless, matters unfit for human food, and the complications that arise in this particular affection may produce substances deleterious to health. From a purely economical standpoint, the investigations have not less interest, for they indicate a course of procedure that may limit the yearly financial loss. I quote the following from Bulletin No. 11, above mentioned, which I believe of sufficient interest to appear in these columns. It is the report of the results of laboratory and field

work. I regret that I am unable at this moment to present plates of the parasite:—

"THE COMMON LIVER FLUKE (DISTOMUM HEPATICUM).

"This well known parasite occurs in the livers of cattle, sheep, and goats of Texas, in sufficient numbers to cause great damage. The portion of the State permanently infected consists of the coast counties and the river bottoms. I have found them also outside of the district indicated, but from the character of the country I do not regard such localities permanently infected or a source of infection.

"The permanently infected district, consists of about two rows of counties along the coast from the Nueces river to the Sabine river, and the river bottoms of the San Antonio, Gaudalupe, Colorado, Brazos, Trinity, Neches, and Sabine. The condition along the Rio Grande has not been determined. Mention should be made of the Red river bottom in the vicinity of Texarkana, as infected. The land is mostly coast prairie, which is flat or slightly rolling.

"Considerable timber occurs along the rivers. Some portions of the land are hog-wallow prairie; other portions have large ponds in which grows a pod-bearing shrub; these are called 'bean-ponds.'

"The river bottoms contain numerous bayous and overflowed places.

"During the rainy season this district becomes very wet. The rivers overflow their banks, and all conditions are favorable for the distribution of parasites. An exception must be made of stock that frequent the salt marshes in the district, as these are comparatively free from flukes.

"*Description of the Parasite.*—Body flattened, leaf-like, pale brown, irregular, the adult from 18 to 31 m. m. long, and from 4 to 13 m. m. wide, oblong, oval, or lanceolate, larger and rounder in front, where it is abruptly contracted in such a way as to present a conical neck; attenuate and obtuse behind. Skin bristling with numerous little points directed backward. Oral sucker terminal, rounded. Ventral sucker large, projecting, with a triangular opening 3 m. m. behind the first. Intestine with two ramified branches visible through the skin, and of a deep shade. Penis projecting in front of abdominal sucker, always recurved. Vulva very small, situated at the side of the male orifice or a little behind. Eggs brown or greenish, ovoid; length from 0.130 to 0.145 m. m.; width from 0.070 to 0.090 m. m. (Neuman). (Copied from 'Animal Parasites of Sheep,' by Dr. Cooper Curtice.)

"The habitat of the adult fluke is the bile ducts of the livers of cattle, sheep, goats, and other ruminants, and occasionally in other domesticated animals. They are also reported by Murray in the lungs of Texas cattle. (*Am. Vet. Review*).

"The life history of the parasite, as determined by Leuckart and by Thomas, is exceedingly interesting and wonderful.

"It is briefly as follows: The fertile eggs leave the adult fluke by the genital pore, in great numbers. They are carried through the bile ducts to the intestines, from which they pass with the excrement. If by good fortune they arrive in fresh water, the eggs hatch in from 3 to 5 weeks. The little lid on one end of the egg suddenly flies open from the struggling of the embryo within, and soon the embryo escapes. This embryo is just visible to the naked eye. It is provided with fine hair-like projections, called cilia, which enables it to swim with great rapidity. In some experiments made in this laboratory some time ago, I was so fortunate as to witness the escape of the embryo as described. The time required for the eggs to hatch was 36 days in the first instance, and 34 days in the second, when kept in a watch glass at ordinary temperature.

"This embryo immediately seeks a fresh water mollusk, into whose body it bores its way with a beak-like projection with which the anterior portion of its body is provided. The English investigators have found *Limnæus trunculatus* as the host. If the embryo fails to find a suitable snail it soon dies. Those I had under observation died in from 8 to 10 hours. Having a suitable mollusk, the embryo bores into the interior of its body by a rotary motion and encysts near the respiratory apparatus. It is now called a *sporocyst*, in whose interior new forms develop called *rediæ*. The *rediæ* produce in their interior other forms called *cercariæ*, which are active creatures.

(To be continued.)

TECHNIQUE.

A New Bacillus in Green Sputum.—Adolph Frick discovered, some months since, a new bacillus not yet described, in green sputum. It differs from the other green chromogenous bacilli, namely, the bacillus *pyocynus*, *bacillus flerescens liquifaciens*, *bacillus virescens*, which have been found also in green sputum, and it differs likewise from the *bacillus viridis pallescens*, *bacillus fluorescens*, *bacillus iris*. In cultures made from sputum it gives a green color, similar to that produced by every known chromogenous bacillus. The bacillus is de-

scribed by E. De Freudenreich, in *Annales de Micrographie*, as being a little longer and thinner than that of typhus. In living individuals, its length is six or seven times greater than its width; four to five when mounted in balsam; the ends are rounded. It is very motile. The sporulation has not been observed. It grows well on gelatine without liquefaction, also in gelose and in broth, to which it imparts a greenish color. It grows well on potato, and in milk, in which it coagulates the caseine. The best temperature is 30° C; from 35° upward the development is slower and less vigorous. The green color at first is somewhat like green grass; later on it becomes yellowish, and even brownish. The coloring is insoluble in alcohol, ether, and chloroform, but soluble in water, particularly when it is alkaline. Its germs do not grow when deprived of air. It is very susceptible to aniline dyes, and may be stained also by the method of Gram.

A New Method of Coloring Spores.—In *Centralblatt fur Bakteriologie*, X, p. 273, Dr. Moeller describes a method of coloring spores which has given better results than any process heretofore employed. It is as follows: The preparation is allowed to dry on the cover-glass in the air. It is then passed three times through a blaze, or plunged two minutes into absolute alcohol; then it is placed two minutes in chloroform (to destroy fats, etc., which exist in certain bacteria), and washed in water. The cover glasses are then plunged from one half to two minutes into chromic acid at 5 per cent, then washed in water. Cover with a few drops of carbolized fuchsin solution, and heat sixty seconds over a blaze, or until the coloring solution boils once. The fuchsin is allowed to drain, and the cover glass is then placed in sulphuric acid at 5 per cent until discoloration; it is then rinsed in water, and finally allowed to remain 30 seconds in an aqueous solution of methyl-blue or malachite-green. The spores are then colored deep red, and the body of the bacilli blue or green. The length of time during which chromic acid should be allowed to act, varies according to the species. A few trials will demonstrate whether 30 seconds will suffice, or if it will take one or two minutes. Some take as long as five minutes; some as short a time as five seconds. Dr. Moeller employs a 5 per cent carbolized solution (according to Ziehl-Neelsen) without alcohol.

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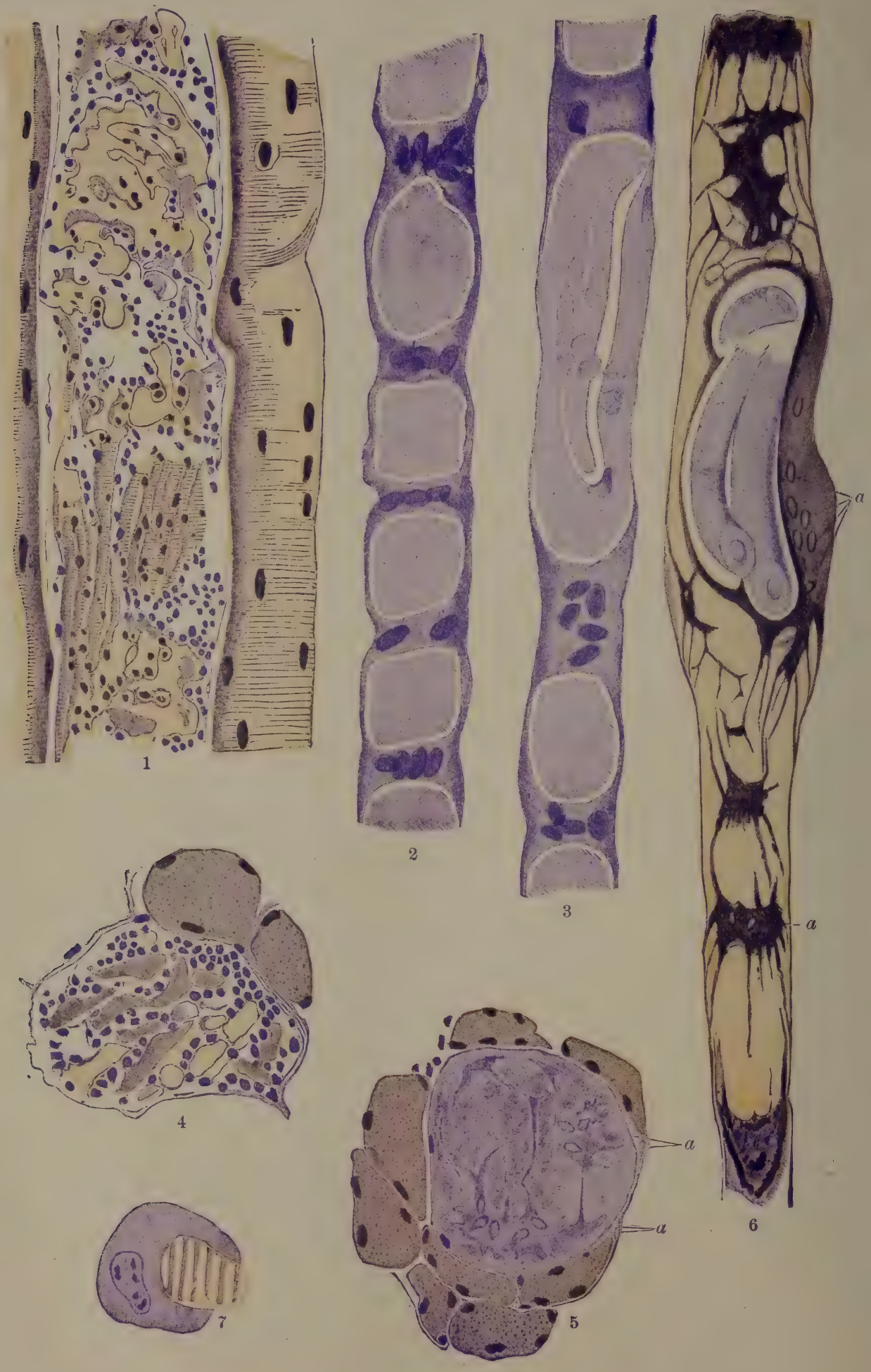
Destroys promptly all odors emanating from diseased gums and teeth, and will be found of great value when taken internally, in teaspoonful doses, to control the fermentative eructations of dyspepsia, and to disinfect the mouth, throat, and stomach. It is a perfect tooth and mouth wash, *indispensable for the dental toilet.*

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CHANGES IN MUSCULAR FIBERS, RESULTING FROM PARASITIC INVASION. (Page 334.)

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., AUGUST, 1892. NO. 10.

ORIGINAL ARTICLES.

STUDY OF IMMUNITY.

BY M. METCHNIKOFF.

THIS delay in dying after the inoculations with the cultures made in the serum of vaccinated rabbits is not due to a true attenuation, but to a special action of the serum; this action also manifests itself with inoculated microbes developed in their usual medium, and mixed with serum of vaccinated animals. The experiments confirm fully this idea, as will be demonstrated in the following chapter. The serum of the vaccinated acts on the most virulent bacilli of hog cholera; but while the cultures in serum of the vaccinated kill after delay, the mixture of serum with virulent cocco-bacilli produces only a passing disease.

The cultures in broth, made with cocco-bacilli developed in the serum of the vaccinated, were fully as virulent as those which were prepared with microbes developed in the serum of new rabbits and transplanted afterward in broth.

From all these facts, we cannot conclude that there is an attenuation of the bacilli of hog cholera cultivated in the serum of vaccinated rabbits. As the degree of virulence must be in proportion to the property of the microbe to produce its toxines, it would be interesting to know if the cocco-bacilli cultivated in the serum of vaccinated rabbits, give to it toxic properties.

Let us introduce virulent blood with a platinum wire into two test tubes, one of which contains the serum of a vaccinated rabbit, and the other the serum of a witness rabbit not vaccinated. Let us allow the microbes to develop during five days, and let us sterilize the cultures at 58 ° C. during one hour. The effect of the inoculation of these sterilized cultures in the auricular vein of rabbits will show us whether with the one made with the serum of the vaccinated rabbits there exist toxic substances. Two experiments undertaken with this object have demonstrated that the sterilized cultures provoke a very manifest disease, which is revealed by the weakness of the animal and an elevation of the temperature. The experiments which have been observed explain themselves by the unequal receptivity of rabbits. This interpretation is the more admissable that in one experiment it was a rabbit which had received the culture of serum of a vaccinated case which reacted the most, while in the other the reverse took place.

The analysis of the virulence of the cultures in serum of the vaccinated is demonstrated by the absence of the attenuation of microbes, and leads us to admit a very marked action of this serum in the march of the malady.

(To be continued.)

APPARATUS FOR CULTIVATING ANAEROBIC BACTERIA, EITHER IN PLATES OR TUBES.

BY J. M. BYRON, M. D.

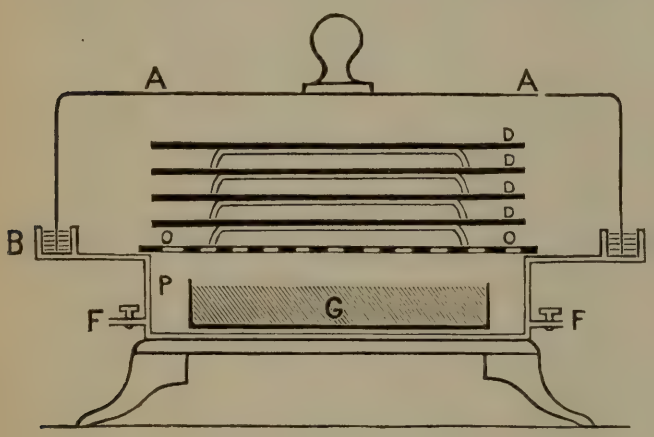
Director of the Micrological Department of the University Medical College, New York.

I HAVE used, during the last three years, with very good results, the apparatus represented in the cut, for cultivating anaërobic bacteria both in plates or dishes and tubes. It enables the operator to observe his plate or tubes at any time without inconvenience, replacing them again if required, in the atmosphere of hydrogen or any other gas used. It is of

very simple construction, and requires about half a gallon of hydrogen to replace completely all the air it contains.

The main body of the instrument consists of a cylindrical dish of brass or zinc (P), eight inches in diameter and two inches high, the upper edge extending into a rim three inches wide. On the circumference of the rim there is a groove or canal three eighths inches wide and an inch high (B), into which a long glass bell, AA, fits. Two small brass faucets (F) are soldered to the lower part of the main body.

When the instrument is used, a glass dish (G) containing a solution of pyrogallic acid or pyrogallate of potash is placed in its lower portion, and a perforated screen (O), a little larger than the main body, is set in the position marked in the cut, to serve as a support to



the culture plates (D). The circular groove (B) is then half filled with mineral oil, the cultures plated and set as in ordinary cases, and the glass bell (A) inserted in its place. Hydrogen from any source is then passed through one of the faucets (T), leaving the other open for the air to escape. In about one minute the air fills with hydrogen, and both faucets close. If any oxygen remains in the interior, it is soon absorbed by the pyrogallic solution, thus leaving an atmosphere of hydrogen for the bacteria to live in. Whenever the cultures have to be examined under the microscope, the bell (A) is lifted. When replacing the culture the same operation of passing a current of hydrogen is repeated.

This instrument presents, among many advantages, the facility of hardening the plates for microscopical examination, which is a serious drawback in most of the methods suggested by the ingenuity of bacteriologists.

THE NEW CHEMISTRY OF THE STOMACH.

BY J. H. KELLOGG, M. D.

THE great interest aroused by the excellent work of Ewald and Boas has waned considerably, in consequence of the uncertainty of the results obtained by the methods recommended for the determination of the quality of the gastric juice. Many of their methods were excellent, and were a decided improvement upon those previously employed, but one weak point in their theory has rendered the results obtained in the practical use of their methods uncertain and disappointing. Adopting the views of Bidder and Schmidt, they assume that the acidity of the gastric juice is due to free hydrochloric acid, when this substance is found to be present, and hence rely for their determination of the quality of a given amount of gastric fluid, upon the results obtained by means of color reagents which indicate the presence or absence of free hydrochloric acid, and a determination of the total acidity by the ordinary methods of acidimetry.

In a work entitled "*Chemism Stomachal,*" by Hayem and Winter, which appeared a few months ago, the faults of the method pursued by Ewald and Boas, and indeed by all previous investigators, have been clearly demonstrated, and a method described which places the chemistry of the stomach upon the same exact basis as that upon which the chemical analysis of the urine rests. Indeed, it is now possible, by the employment of the method perfected by these eminent investigators, to determine the quality of a given stomach fluid with the same degree of accuracy as one may determine the character of the urinary secretion,—by means of well known qualitative and quantitative tests.

The claims made by Hayem and Winter for their method are so great as to give rise to a suspicion of unreliability, were it not for the high standing of the authors, and for the absence of any good reason for doubting the claims made and the accuracy of the chemical methods employed. The writer has further sought to assure himself of the accuracy and reliability of the method proposed, by devoting himself to a careful study of it

and its practical use, in a sufficiently large number of cases to enable him to say that every statement made by the authors in their work, concerning their method, may be relied upon as absolutely exact, and that the method may be accepted as thoroughly accurate and reliable, and the greatest advance in the diagnosis of disorders of digestion which has been made within the last quarter of a century.

Briefly outlined, the method pursued by Hayem and Winter is the following: The patient is given a test breakfast, consisting of two ounces of stale white bread, and eight ounces of weak tea without sugar and cream (the writer employs hot water instead of tea). One hour after the patient begins to eat, the stomach fluid is withdrawn by means of a tube. After filtration, 5 c. c. of the filtered stomach fluid is placed in porcelain capsules designated respectively as *a*, *b*, and *c*. An excess of carbonate of soda is added to capsule *a*. After evaporation to dryness, the residue is calcined, and the quantity of chlorine present is determined by means of a titrated solution of nitrate of silver in the presence of bichromate of potash. The result obtained, gives the *total chlorine* present in the stomach fluid, all the chlorine not previously combined with bases having been fixed by the excess of soda added before evaporation.

Capsule *b* is treated somewhat differently, being first evaporated to dryness on a water-bath, and then dried for an additional hour. By this means the chlorine present in the liquid in the form of free hydrochloric acid, is driven off. After evaporation and drying for one hour, an excess of carbonate of soda is added as before, and the residue is then calcined and the same method pursued as with capsule *a*. The result obtained represents the total chlorine present minus the chlorine existing in the form of free hydrochloric acid. It is apparent, then, that by subtracting *b* from *a*, the amount of *free chlorine* may be obtained.

Capsule *c*, after drying, is calcined without the addition of the soda, and the amount of chlorine obtained by the same method. The result obtained in this case represents the *fixed chloriue*, or chlorine combined with bases, usually sodium. By this method, three known quantities are determined: —

1. The total chlorine.
2. The amount of free chlorine, and,
3. The amount of fixed chlorine.

By comparing the results of the analyses of capsules *b* and *c*, there is found to be a difference in favor of *b*, in case the fluid examined is a product of normal digestion; in other words, the chlorine represented by *b*, is in excess of that represented by *c*, showing that chlorine exists in the gastric juice in another form than that of free hydrochloric acid, and fixed chlorides. The investigations of Richet, published a few years ago, showed that a considerable amount of chlorine exists in the gastric fluid, combined with albumen in the process of digestion. By subtracting *c* from *b*, the amount of chlorine so combined is determined.

The four quantities thus obtained — two by analysis and two by subtraction — are represented as follows: —

Total chlorine, T.

Free chlorine, H.

Chlorine combined with albumen or organic chlorides, C.

Fixed chlorine, F.

Having determined these four quantities by chemical analysis, the total acidity represented by A, is next determined.

A solution of Congo red is employed as a qualitative test for the presence of free acids, and methyl violet, Günzburg's reagent, or the resorcine and sugar test, is used to show the presence of free HCl. The color reactions are, of course, simply confirmatory of the results obtained by chemical analysis, but are of comparatively little practical value, as they give no very positive idea respecting the quantity of free acid present.

T represents the glandular work of the stomach, including also the amount of sodium chloride contained in the food.

H and C together (H + C) represent the chemical work of digestion, which consists of two parts: —

1. The breaking up of the chemical combination of chlorine with bases, and the production of free hydrochloric acid.
2. The combination of hydrochloric acid with albumen, the first step in the process of hydration by which the albumen is converted into peptone.

H represents the amount of free hydrochloric acid ready for combination with albumen; C, the amount already combined.

It is evident, then, that by a compari-

son of the figures obtained for T, H, and C, in the case of a given stomach fluid, with the figures presented by a normal stomach fluid, we have an exact means of appreciating any modification of the normal digestive work which may be the result of morbid conditions. By a study of the results obtained upon healthy dogs and individuals, it has been shown that the quantity H (free HCl) is always small in normal digestion, as compared with C (chlorine combined with albumen or organic chorides). It is also found that combined chlorine (C) contributes as much to the acidity of the given stomach fluid, as the same amount of chlorine would do if in the form of free hydrochloric acid (HCl).

By careful quantitative analysis, it has been shown that the total acidity (A) is chiefly due to H (free HCl) and C (combined chlorine). Lactic acid and acid phosphates contribute very slightly to the total acidity of the normal conditions, hence the formula under normal conditions would be, practically, H+C=A.

From this formula may be derived the following: $\frac{A-H}{C}=1$. This is not absolutely true, however, as A, in small part, is made up of acid phosphates, and in the early stages of digestion also lactic acid. There are also present even in normal cases a small proportion of neutral or ammoniacal chloro-organic compounds, so that normally we find .86, instead of 1. This quotient is termed the coefficient of digestion, as it is a means by which a most important fact respecting the quality of the digestive process may be determined. This quality is represented by *a*, which we may term "coefficient *a*." The use of coefficient *a* will be recognized by studying the following formulæ, which result from conditions to e named: —

In certain morbid states, the combinations of chlorine with albumen, or chloro-organic compounds, are, in large part, neutralinstead of acid. Such compounds are the results of abnormal products of digestion, and of no use from a nutritive standpoint. These neutral substances, while contributing to the value C, contribute nothing to the value A, consequently in a case of this sort, we should have the formula, A=H+C—C′, in which C′ represents the neutral chloro-organic compounds, instead of A=H+C. Transposing H, and dividing both members of the equation by C, as before, we obtain the formula $\frac{A-H}{C}=a-\frac{C'}{C}$, in which it is evident that the coefficient *a* will be less than normal; that is, less than .86, because C is below par. The real value of C is diminished just in proportion to the amount of neutral organic compounds present. In cases of this sort, A is always small in proportion to H and C.

It not infrequently happens, however, that A exceeds the sum of H and C; in other words, we have the formula A=H+C+x, in which x represents the amount which A exceeds the sum of H and C. Transposing H as before, and dividing both members of the equation by C, we have $\frac{A-H}{C}=a+\frac{x}{C}$, in which it is evident that coefficient *a* exceeds the normal quantity. These cases are those in which normal digestion is complicated by acid fermentations.

It is apparent that coefficient *a* serves a most useful purpose in two cases, in one of which it is less than normal, which indicates that the value of C is diminished just in proportion to the amount that A is diminished; in other words, that the quality of the work done by the stomach is bad, just in proportion as *a* is less than normal. On the other hand, when A is above normal, the indication is, that acid fermentation is present, and in amount just in the proportion that A exceeds the normal quantity. We have here, then, a means of determining two things, which by all previous methods have been left undetermined: 1. The quality of the work done by the stomach; 2. the proportionate amount of acid fermentations present.

Both these facts are of the greatest practical value. C is the index to the actual useful work done by the stomach, but C may be large, and yet the value of the work done be nothing, in consequence of the catalytic changes upon which the chemical work of the stomach depends having taken a wrong direction, so that the chloro-organic compounds formed are neutral instead of acid. This condition will be shown by coefficient *a*, without which it could not be definitely determined, although it might be suspected by the diminished value of A. On the other hand, when A is increased by acid fermentation, the fact might be taken

as an indication of hyperpepsia, instead of acid dyspepsia, if reliance were placed upon the total acidity taken in connection with the presence of free hydrochloric acid, as shown by color reagents, and without the determination of the amount of free chlorine and the value of coefficient *a*.

By long and painstaking studies of the digestive process in healthy men and dogs, Profs. Hayem and Winter have established the following figures as representing the normal limits of variation in healthy digestion : —

	Normal variations.[1]
Total acidity (A)	(0.180 —.200 gms.)
Coefficient (a)	(.86)
Total chlorine (T)	(0.300 — 0.340 gms.)
Free HCl (H)	(0.025—0.050gms.)
Organic chlorides(C)	(0.155—0.180gms.) .180–.225
Fixed chlorides (F)	(0.109 gms.)

By the use of the above interesting *data*, it is possible to represent the different states of digestion. In normal digestion each of the symbols would be followed by the sign =; that is, the quantities represented by each of the symbolic letters in the formula are within the limits of normal variation as follows: $A{=}a{=}T{=}\left.\begin{matrix}H{=}\\C{=}\end{matrix}\right\}{=}$.

For typical hyperpepsia we have the following formula : —

$$A+a=T+\left.\begin{matrix}H+\\C+\end{matrix}\right\}.$$

And in hypopepsia we have the typical formula : —

$$A-a=T-\left.\begin{matrix}H-\\C-\end{matrix}\right\}-.$$

It is evident, however, that an almost infinite number of variations and modifications of these formulæ is possible, according as one or all of the different elements of the digestive work are exaggerated or diminished. We may have, for example, an increased amount of gland work on the part of the stomach, with diminished chemical work, in which case T would be +, and the sum of H and C — (H + C) —.

We may also have a sufficient amount of that phase of chemical work which consists in a liberation of the chlorine from the bases, together with an abundant secretion of fixed chlorine, coincident with the failure of the chlorine to combine with albumen, in which case our formula would be $T+\left.\begin{matrix}H+\\C-\end{matrix}\right\}{=}$. We may even have an excess of chlorine set free, and yet a very great deficiency of combined chlorine, through the failure of the chlorine to enter into normal combination with albumen. Then we should have $\left.\begin{matrix}H+\\C-\end{matrix}\right\}+$; or we may have H + with C —, and the sum of H and C less than normal, shown by the formula $\left.\begin{matrix}H+\\C-\end{matrix}\right\}-$.

It is evident that H and C considered separately and together, represent the useful work done by the stomach, especially when taken in connection with the quotient or coefficient *a*.

In their study of pathological cases, Profs. Hayem and Winter have employed the following simple method of classification, which seems to work very well in practice :—

Considered with reference to the amount of stomach work done, pathological cases may be divided into hyperpepsia, hypopepsia, and an intermediate form, simple dyspepsia. Typical hyperpepsia is expressed by the formula already given, in which all the qualities are above normal, or +, with the exception of *a*. It is rare, however, to find a case in which there is simply an exaggeration of stomach work. There is, almost without exception, some qualitative modification of the digestive process, the recognition of which is of the highest importance. This leads to the subdivision of hyperpepsia into two classes, *quantitative* and *qualitative*, in which the characteristic deviations from the normal digestive process are, respectively, a simple exaggeration of stomach work, and a qualitative modification of the character of the work done.

Both these classes, qualitative and quantitative hyperpepsia, are again subdivided into two varieties, this division being based upon the simple difference in degree, the lesser degree being only an attenuated form of the higher degree of simple qualitative or quantitative, with qualitative change. The term "attenuated" is used to designate the less pronounced variety. We thus have simply quantitative hyperpepsia, and quantitative hyperpepsia attenuated, and also hyperpepsia qualitative, and hyperpepsia qualitative attenuated.

A still further subdivision of each of the four classes of hyperpepsia thus made, is

[1] Quantity of chlorine expressed as HCl.

based upon the presence or absence of acid fermentations; so that, in all, we have eight types of hyperpepsia. It ought to be mentioned, perhaps, that Hayem and Winter designate but one type of the attenuated form of qualitative hyperpepsia, viz., without acid fermentations, *a* being —, or =; but the writer has met several cases of this form of hyperpepsia in which acid fermentations were present, and so has taken the liberty to add to the classification, as completing the systematic scheme, the type hyperpepsia qualitative attenuated, *with acid fermentation.*

The basis for the subdivision of cases of hypopepsia chosen by Hayem and Winter is a wholly artificial one. They make three degrees of hypopepsia, in all of which we of course find A —. Cases in which A is less than normal, but above 100, are designated as hypopepsia of the first degree; those in which A is less than 100, and still a measurable quantity, are designated as of the second degree. Cases in which A is nothing are placed in the third class of apepsia.

These three classes are with the exception of the third, each subdivided, as in the case of hyperpepsia, into two types, according as acid fermentation is present or absent. In the third class there is no acidity and hence no fermentation.

With reference to cases of hypopepsia, the value of A becomes a matter of great interest. The total acidity is not infrequently found to give a very high figure, notwithstanding the existence of hypopepsia in a very marked degree, evidently as the result of the excessive acid fermentation which is very likely to be present in this class of cases, owing to the deficiency of free hydrochloric acid, the natural antiseptic of the gastric juice. Before the classification of cases of hypopepsia can be properly made, we must determine the true value of A, that is, the amount of acidity due to the normal acid elements of the stomach fluid, the free HCl (H), and the organic chlorides or chloro-albumen compound (C).

The method of Ewald and Boas, which determines the quality of the digestive fluid by measuring the acidity and ascertaining by color reagents the absence or presence of hydrochloric acid, is notably defective, since it practically considers acidity to be always due to free HCl (H). Normally, as above stated, A is composed of free HCl (H), combined HCl (C), and a small amount of lactic acid and acid phosphates. In pathological cases, however, the greater part of A may be composed of acids of the fatty series,— lactic, acetic, butyric, and formic acids,— resulting from fermentation.

The determination of the presence of these acids by color reagents is a somewhat uncertain process, and sometimes entirely fails, while any quantitative estimation relating to fatty acids is quite out of the question in the examination of stomach fluids, in consequence of the small amount of material usually available in an individual case.

The great advantage of the method of Hayem and Winter, and its remarkable exactness, is well shown in the ease with which it enables us to determine the true value of A. Returning to the formula $\frac{A - H}{C} = a$, we have, by multiplying both members of the equation by C, and transposition, $A=(a\times C)+H$. To ascertain the *true value of A*, which we may designate A′, in any given case, we have only to substitute in this equation the normal value of *a*, .86; then making the simple calculation indicated by the formula, we have at once the true value of A. The following case will illustrate the value of this method in the determination of the true valueof A: —

In a case of very pronounced stomach disorder of long standing, the figures found for A were .313 mgs., and for *a*, .514 mgs. It should be remembered that the figures for A represent the acidity expressed in milligrams of HCl per 100 c.c. of the stomach fluid examined. In this same case, H was found to be .056, and C, .050. Following the method above indicated, we find the value of A′ to be 99, from which we discover at once that there is an enormous diminution of useful stomach work, although there happens to be a considerable amount of free hydrochloric acid present. The high figure of *a*, and the figure obtained for A′ show at once the cause of the hyper-acidity, notwithstanding the failure of the reaction for fatty acids, which we have found, as doubtless have most other physicians who have made a careful study of the chemistry of the stomach, is to a high degree unreliable.

The classification of cases of hypopepsia is, of course, based upon the

HYPERPEPSIA.	QUALITATIVE	A+	without acid fermentation	a —;=	T+	H+ C— +;
			with a. f.	a +		
		A=;— attenuated	without a. f.	a =;—	T—;=	+H+ C— —;=;+
			with a. f.	a +		
	QUANTITATIVE	A+	without a. f.	a =;—	T+	H+ C+;= +;
			with a. f.	a +		
		*A—	without a. f.	a =;—	T+	H+ C+ +;
		A+ attenuated	without a. f.	a =;—	T+;=	H=;— C+;= +;
			*with a. f.	a +		
HYPOPEPSIA.	1ST DEGREE A—(A′—) ABOVE 0.100	without a. f.		a —;=	T—;=;+	H—; 0 C—;+= —;+;=
		with a. f.	A+ (pseudo-hyperacidity)	a +	T—;=;+	H—; 0 C—;+ —;=
			A—	a +	T—;=;+	H—; 0 C—;= —
	2ND DEGREE A—(A′—) BELOW 0.100	without a. f.		a —;=	T—;=;+	H 0;— C—;=+ —
		with a. f.		a +	T—;=	H 0;*— C— —
	3RD DEGREE A=0 (Apepsia)			a. 0	T—	H 0 C 0;—+ 0 ;=

* Types bearing this mark have been observed by the writer and added to the classification of Hayem and Winter.

value of A′, and not upon that of A. This gives rise to a sub-type of hypo-pepsia characterized by pseudo-hyper-acidity, in which A is +—although A′ is—.

These cases are found in the fermentative type of the first class of hypopepsia. In the accompanying table, copied from the work of Hayem and Winter without change, with the exception of the addition of a single type, as before mentioned, the several classes of hyperpepsia and hypopepsia are represented by their respective formulæ. Where more than one sign occurs, as =; —, or —; =, +, it should be understood, not that these signs occur in any given case, but that the quantity to which the signs are attached, may, in different cases, exhibit either one of the relations as regards the normal quantity indicated by the several signs. It should also be added that the attenuated form of hyperpepsia quantitative, which is placed by Hayem and Winter as one of the principal classes of hyperpepsia, is in the chart placed as a sub-variety of quantitative hyperpepsia, which seems to be its most natural place.

In the careful chemical study of more than 100 cases, by the methods of Hayem and Winter, we have found a constant confirmation of their results, and a demonstration of the great advantages presented by this method over all others. We have also found their classification, on the whole, eminently satisfactory, although quite a number of cases have been met with which do not fall exactly in either of the classes described. Some of these are cases of simple dyspepsia, cases in which the deviations from normal are so slight as to be insufficient to allow a classification of the case as either hyperpepsia or hypopepsia.

I have found however, a few interesting cases in which the type is decidedly different from any of those included in the classification of Hayem and Winter, which will perhaps require an addition to the above scheme of classification. My cases, however, illustrate each of the varieties of dyspepsia shown in the classification given above, as well as some new phases, concerning which further remarks will be made.

(To be continued.)

RESULTS OF PURE CULTURES OF TUBERCLE BACILLI AND OTHER PATHOGENIC BACTERIA FROM SPUTUM.

BY DR. S. KITASATO.

Translated from *Zeitschrift für Hygiene*, Vol. IX., No. 3, by Hanau W. Loeb, A. M., M. D.

THE statement that it is impossible to obtain pure cultures of tubercle bacilli direct from man, without passing through the bodies of animals, is widely disseminated, in accordance especially with the views of French observers. However, the importance of obtaining such tubercle bacilli from man for experiments on animals is evident; otherwise the ob-

jection might well be made that in passing through the organs of such animals, changes might result which would differ from what occurs in man; that the experimental knowledge gained by such cultures from animals should not be used without further observation on the relation they bear to human tuberculosis. In fact these objections have already been raised.

On this account the duty was assigned me by Professor Koch, of making pure cultures of tubercle bacilli from tuberculous sputum, and from the closed lung cavities found in the *post-mortems* performed at the institute.

The difficulties which opposed the solution of this question, especially in the cultures from sputum, lay, on the one hand, in the different developmental energies of the tubercle bacilli, and on the other hand, by reason of the intermingling of these bacteria with other micro-organisms. While the former developed uncommonly slow and scanty, the bacteria mixed with the sputum occurring constantly in the mouth were able to increase very rapidly and luxuriantly, and thereby preponderate over the tubercle bacilli. It was therefore necessary to do away with this admixture in the mouth.

In order to bring this about, Professor Koch proposed a procedure by which he had succeeded previously in the solution of this question, and by following which I was enabled to obtain results from the pure cultures of the tubercle bacilli from sputum. To this end, the patients were watched so that they expectorated the morning sputum, resulting from a true cough and not from hawking, into sterilized double dishes. (*Doppelschälchen.*)

The dishes containing the sputum must be further acted upon. A specimen being found appropriate, that is, originating from the deeper portions of the respiratory apparatus, the sputum flakes were isolated with sterilized instruments, and carefully washed in at least ten double dishes (Petri's preferred) filled with sterilized water.

By this means nearly all the other bacteria mixed in the sputum in passing over the surface of the mouth, are removed.

The sputum in the last vessel is then macerated under sterilized water; by preparing a portion of this for microscopical examination, one may easily determine if any other bacteria but the tubercle bacilli remain.

This is often successful, so that by taking a portion of sputum thus prepared and putting it in glycerine-agar or blood-serum, pure cultures of tubercle bacilli are obtained.

The pure cultures from this prepared sputum differ somewhat from the cultures taken from tuberculous organs, especially in the beginning of their development. Like the latter the first colonies appear in about two weeks, but they exhibit in the beginning an entirely different appearance. They appear as circular, white opaque specks, which are raised to the surface of the agar. They are therefore, moist, glistening, and smooth as colonies of white yeast, while the colonies of tubercle bacilli obtained from the organs are in the beginning dry, dull, and wrinkled. These differences soon disappear so that in four weeks it is impossible to distinguish between the cultures from sputum and those from the organs.

The cultures which I made from closed lung cavities act as those of the sputum just described. Nothing else could well be expected, as the sputum is really the contents of the cavity. However, it is not always possible to obtain pure cultures of tubercle bacilli from closed cavities, because other bacteria sometimes occur even here among the tubercle bacilli, from which a diagnosis must be made by microscopical cultivation experiments. I would, however, emphasize that this does not represent a mixture of different bacteria, but there is constantly found a pure culture of bacilli or cocci which is present along with that of the tubercle bacilli. In my opinion it is quite possible that these complicating bacteria present in the pure cultures, play an important role in the course of the disease, tuberculosis.

In the production of pure cultures of tubercle bacilli from sputum and closed cavities, a further important fact should be announced, viz., that most of the tubercle bacilli in the sputum and in the contents of cavities were dead. However it was impossible to distinguish by means of the microscope the difference between the living and dead bacteria. They responded to staining agents just as rapidly and intensely as the other,

and morphologically they exhibited no asymmetry. Notwithstanding this, the fact that they were really not living could be determined in the following way: —

When a larger quantity of sputum or of the contents of a cavity than is necessary for the culture experiment, is taken to place upon the surface of the agar, this material remains visible in the nutritive medium for a week, provided evaporation is prevented by covering the tube with a rubber cap. Frequently there are in such a tube, evident particles of sputum or of the contents of the lung cavity which are completely sterile; while in other cases colonies of tubercle bacilli develop within the little tubes. When microscopical preparations of such sterile portions of the sputum or cavity contents are made, numerous well-stained tubercle bacilli will be found. In addition, I have taken these portions of sputum or of the contents of cavities so richly charged with tubercle bacilli, and inoculated guinea pigs, killing the pigs two months thereafter. In no case has there appeared a sign of tuberculosis.

This experiment clearly shows that the majority of the tubercle bacilli in the sputum and contents of the lungs are dead, yet this could not by microscopical examination be established until now.

But I have given my attention not alone to the before-mentioned tubercle bacilli in tuberculous sputum, but also to the other bacteria therein contained. I have, for instance, made the observation that frequently among the tubercle bacilli, other colonies of bacteria are so constantly and numerously found that I was forced to believe that there had been such an invasion within the individuals so afflicted. In fact when an autopsy of such patients was made, the micro-organism was found distributed in a pure culture over the whole lung. In one case, in which the parasite seen was a small bacillus, it was found in pure cultures in all the inner organs. In this manner, I met with other kinds of bacteria in the sputum of tubercular patients, which were constantly present among the tubercle bacilli, and which were in the *post mortem* examination later demonstrated in the lung. Three of these were bacilli, two streptococci, and three micrococci. The number of micro-organisms found in the sputum varied very often in the further observations on this subject.

Besides these, I have noticed still other kinds of bacteria in the tubercular sputum. In these, however, an autopsy was not allowed, and hence further observation was impossible. With reference to these kinds of bacteria and with regard to the questions dependent upon their presence, I am not able to report further investigations. Dr. Cornet is concerned in this problem, and he will later present his more accurate observations.

Experiments in the Treatment of Tuberculous Guinea Pigs with Tuberculine.— Since the memorable Congress of Berlin, at which Prof. Koch described the discovery of his famous lymph, by which it was hoped that in the near future human beings suffering from consumption could be treated successfully, people all over the world have been anxious to hear more about this treatment from the discoverer himself. It is already more than one year since the first print appeared under the authority of the celebrated bacteriologist, and the scientific world has been patiently waiting ever since to hear more from the famous laboratory. Consequently it was with a great deal of hope that the recent contribution of Mr. Pfuhl, the closest collaborator of Koch, was expected. However, we do not find in it any more assurances that Koch's tuberculine will ever be of any practical utility in the treatment of consumption than we had received before. The conclusions of Pfuhl (*Zeitschrift für Hygienen, Infections Krankheiten, II. p. 24*) are: —

1. Small doses of tuberculine are without utility, even when combined with calomel, sublimate, gold, silver, arsenic, creosote, and benzoate of soda.

2. On the other hand, we arrive at very favorable results with high doses continued for some time.

3. A regressive modification of the tuberculous alterations is produced, probably only when tuberculine gives rise to local reactions.

We must say that not one of these three conclusions is very encouraging. The second might give some hope, were it not for the fact that even this conclusion is not very strongly supported by the experiments on which it was based.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE LIVER AS A BILE-MAKING ORGAN.[1]

BY DUJARDIN-BEAUMETZ.

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Translated by J. H. Kellogg, M. D.

(Concluded.)

Composition of Bile. — Bile has been analyzed a great number of times. I shall not dwell long upon its different constituents. I will leave the consideration of cholesterine to the next lesson, in which I shall speak of the biliary calculi.

Biliary salts belong to two groups of salts of soda, — the tauro-cholate and the glyco-cholate of soda. The alkalinity of the bile is due to these salts of soda, a property which gives it its popular use for removing spots from clothing. It is also these intensely alkaline salts, which contain 90 per cent of soda, which give to the intestinal fluids their alkalinity.

I place salol at the head of drugs which combat intestinal putridity, because this salicylate of phenol decomposes itself into phenic acid and salicylic acid only in the presence of the alkalines.

Finally, I must call your attention to the fact that these salts do not exist preformed in the blood, and that they are found only in the bile.

I must dwell a little further upon the coloring matter of the bile. This coloring matter consists of bilirubin. The reactions by which bilirubin is recognized in the urine are two. One is obtained by the actionof nitric-nitrous acid upon the urine. It produces a series of colors from red to green. The last alone is characteristic.

The method of examination which appears to me to be preferable consists in allowing the urine to fall, drop by drop, upon the nitric acid contained in a test tube.

The reaction by iodine is also characteristic. I am surprised to see it not more frequently referred to, even in classical works. In adding some drops of iodine to icterous urine, an emerald green coloration is the most characteristic reaction to be obtained. In doubtful cases a more complex proceeding may be employed. It consists in precipitating by sulphate of ammonia, and dissolving the precipitate in a mixture of alcohol and chloroform, then obtaining the characteristic reactions by means of nitric-nitrous acid.

While biliary salts are a product of the action of the hepatic cell, bilirubin may be produced outside of the liver. It may be obtained by submitting hæmoglobin or hæmatine to the action of nascent hydrogen. Besides, it is only necessary to compare the formulæ of hæmatine and bilirubin, to see the numerous points of resemblance which these two substances present.

$$C^{32}H^{32}Az^{4}O^{4}Fe'' + 2H^{8}O = C^{32}H^{36}Az^{4}O^{6} - Fe.''$$

Hæmatine. Bilirubin.

I cannot allow this question of biliary pigments to pass, without speaking of urobilin, to which I have already referred in my lesson upon the antiseptic function of the liver.

Between urobilin, bilirubin, and hæmoglobin there are numerous points of resemblance, and urobilin may be obtained from hæmoglobin and bilirubin. Urobilin does not give, in the urine, the reaction of Gmelin, with nitric-nitrous acid, but a brown coloration.

Numerous discussions have arisen respecting the origin of urobilin. You will find these presented with much care in the thesis of Dr. Paul Tissier. We have, first, the pigmentary theory, which holds that urobilin is the result of absorption from effusion of blood in the tissues.

Persons suffering from cerebral hemorrhage present urobilin in the urine.

In a case of chronic icterus, urobilin is seen to take the place of bilirubin. The hæmatic theory holds that urobilin, a modification of hæmoglobin and hæmatine, is produced outside of the liver. This is the old theory of Goubler.

Finally, in the third theory, urobilin is regarded as exclusively furnished by a diseased hepatic cell. This theory has been sustained by Prof. Hayem and his pupil, Paul Tissier.

While recognizing the fact that in the majority of cases in which urobilin is present, there are diseases of the liver

[1] A series of lectures delivered by Prof. Dujardin-Beaumetz, published in the *Bulletin General Therapeutique*, and translated expressly for this journal.

there are certain disorders of the blood, and in some, cases of cerebral hemorrhage in which urobilin is found in the urine, without any disturbance of the functions of the liver.

However, whatever the origin of bilirubin may be, whenever the characteristic line of urobilin is found in the urine, we should examine with the greatest care, and suspect some lesion of the hepatic cell.

There has been much discussion as to whether the liver is a gland, properly so-called, or an organ of excretion. Between these extreme opinions which hold, the one that the liver only separates from the blood the substances previously formed, and the other which affirms, on the contrary, that this organ forms the bile wholly, there is a mixed opinion which appears to me to agree exactly with the statements which I have above presented. It is that the liver, considered as a biliary organ, is at once a gland, properly so-called, and an organ of excretion.

It is a gland proper, since we find in the bile, tauro-cholate and glyco-cholate acids which generally exist in the blood. It is an organ of excretion, since the coloring matters of the bile are derived from the coloring matter of the blood, and since, also, the bile incloses some toxic products.

The toxicity of the bile, which remains for me to examine, has been placed in a clear light by the works of Bouchard. Bouchard, in comparing the toxicity of the urine with the toxicity of the bile, has shown the following facts: In equal volume, bile is nine times more toxic than urine, and the biliary secretion presents a toxicity six times as great as the urinary secretions. So that if one admits that all the biliary secretion remains in the blood, a man would be killed in eight hours, while if the same occurred with urine, two days and four hours would be required.

Of all the substances contained in the bile, bilirubin appears to be the most toxic. It kills in intravenous injections, in doses of 5 centigrams per kilogram of rabbit. I should remark that in the experiments of Prevost and Paul Binet, in which the drugs employed were administered by the stomach, toxicity of the bile was scarcely appreciable, the bile being administered to animals in forty gram doses without producing any symptoms. The liver then, as the kidney, is an organ of excretion of the toxines of the economy.

Another point which is of the greatest interest, has been brought to light by the recent works of E. Dupré. It is that the bile contains no micro-organisms. Duclaux had already indicated this fact; in the normal state, no cultures had ever shown the slightest trace of organisms.

This is a fact which, *a priori*, is very curious. When one considers the intimate relations between the biliary passages and the contents of the intestine, in which microbes are so numerous, we may draw from the absence of micro-organisms an important conclusion. It is that the effusions of bile into the serous cavities can produce no inflammatory phenomena when the bile is healthy, as has been demonstrated by Dastre. It should be understood that we speak here of the healthy state, for there exists, as we shall see in the next lesson, biliary affections. There are often found in the bile, bacteria and streptococci, constituting what has been described under the name of "biliary infection."

The bile, as I have said, is an anti-ferment; it prevents the putrefaction of substances contained in the intestines. This is so true, that when, for any cause, the bile ceases to be thrown into the digestive tube, fæcal matters produce their characteristic odor and become putrid.

Bile is, further, a lubricant; it permits the alimentary canal bolus to pass easily along the whole extent of the intestine; thus its suppression leads to constipation.

Bile is, finally, an alkaline substance. The acidity of the fæcal matters deprived of bile provokes the painful colics experienced by icterous patients as the result of retention of bile.

Finally, it is the alkalinity of the bile which assists the emulsification of fats, and if the bile does not transform the fats as does the pancreatic fluid, it renders them more digestible by their emulsification. Hence the great emaciation of patients suffering from chronic icterus resulting from tension.

We see a great variety of symptoms resulting from an insufficiency of urine to which the generic name of "uræmia" has been given. So also a suppression of the secretion of the bile, or its passage in too great quantity into the blood, produces a group of clinical symptoms to which has

been given the name of "cholestræmia," among which appear convulsions and coma similar to those of uræmia.

In the next lesson I shall consider what therapeutic conclusions can be drawn from the physiological study of the liver as a bile-making organ.

MODIFICATIONS OF MUSCULAR FIBERS IN TRICHINIASIS.

BY M. SOUDAKEWITCH.

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Translated by Paul Paquin, M. D.

(See Frontispiece.)

It has been demonstrated that in the various inflammatory pathological phenomena of the muscles, the modifications that take place are generally secondary; the inflammatory processes are at first localized in the connective tissue, and it is after a more or less prolonged period that the phenomena extend to the muscles. In trichiniasis a striking example is given of the difference. Here we have a primary lesion of the muscles; a paranchymatous inflammation, in fact. In this disease the parasites leave intact the intermediary tissue, and penetrate directly into the muscle fibers, where they provoke a serious modification. It has been well established that phagocytes play an important role in numerous pathological conditions produced by the introduction of foreign bodies among the organisms. The phenomena of phagocytosis have been well observed by the above named author in the disease produced by trichina. In view of the fact that the parasites to be fought are comparatively large (and it is always possible to ascertain whether they are alive or dead), it is interesting to know, in this condition, what cellular element plays the role of phagocytes. In all cases of trichiniasis, the muscular tissue affected was found to react as in the introduction of foreign bodies, producing the activity of the surrounding elements. Affected muscular bundles become surrounded, at their periphery, by little cells with either round and regular nuclei, or at other times, lobulated nuclei.

A great number of these cells introduced thus into the fissures made along the muscle bundles, the edges of which demonstrate semilunar or nearly round notches, were filled with leucocytes. The contour of these bundles became more and more irregular, as if they had been gnawed. The longitudinal and transverse fissures gradually become more positive and more marked, until the bundles produce separate particles of muscular tissue, which are soon surrounded by numerous groups of leucocytes. These little isolated masses of muscle are surrounded by the protoplasm of the enlarged leucocytes. Among the small cells, there exist occasionally a few typical giant cells, containing particles of muscular tissue.

It is plain that muscular tissue, independent of the intermediary tissue, reacts against the irritation provoked by trichina. Very soon after the introduction of the parasite, the contractile substance suffers a modification of degeneracy; the sarcoplastic part augments in volume. Its nuclei multiply, and the cellular masses thus formed (resembling plasmodia) surround the degenerated regions. Another part of the sarcoplasm with multipled nuclei gathers around the trichina in the form of large giant cells. We have consequently before us a case of activity of the phagocytes developed in the interior, and directly at the expense of the muscular bundles.

EXPLANATION OF PLATE (FRONTISPIECE).

All the figures have been made with ocular 3 and the system 3 and 4 of Verick, except Fig. 7, which was made with No. 9 of Hartnack.

Fig. 1. A necrosed muscular bundle transformed into a separate portion by means of the leucocytes. In certain places we see the leucocytes introduced into the interior of the muscular portions, and lodged in a kind of vacuole. In the lower part of the figure we see a longitudinal fissure. This is from a case of trichiniasis in man.

Fig. 2. Muscular bundles of a white rat. The hypertrophied sarcoplasm with multiplied nuclei surrounds the necrosed parts of the contractile substances.

Fig. 3. Bundle resembling the preceding one with a trichina larva in the interior. Around the trichina we observe an agglomeration of sarcoplastic nuclei.

Fig. 4. Transverse section of a bundle similar to Fig. 1.

Fig. 5. Transverse section of a bundle, the contractile substance of which has been, after movement of the parasite, mingled with the sarcoplasm. The latter presents in *A* the muscular nuclei in which we may observe the erythrochromatic degeneracy of the nuclei.

Fig. 6. Longitudinal section of a muscular bundle similar to that of Fig. 5. In the interior of this muscular bundle we observe a trichina turned

on itself. The sarcoplasm and the nuclei surround the parasite on all sides. The figure gives a very clear picture of a mixture of the necrosed and contractile snbstances with the sarcoplasm. This is a case of trichiniasis in man.

Fig. 7. A leucocyte, containing a bit of necrosed, dissociated muscular tissue. Another case of trichiniasis in man.

PHAGOCYTES AND IMMUNITY.

In an interesting discussion before the Pathological Society of London, relating to the various doctrines concerning phagocytes and immunity, Dr. Ruffer recently presented some very interesting facts and arguments in favor of the doctrines of Metchnikoff, a few of which we quote: —

"As to the substances which attract the amœboid cells toward the virus, they have been proved to be the poisons secreted by micro-organisms, or contained in their bodies. It is probable also, that in some cases these poisons have the opposite effect, namely, that of repelling amœboid cells. I have lately gained considerable evidence to show that the same substance may attract or repel leucocytes, according to its state of concentration. I may mention one such experiment. If a small piece of sterilized sponge be soaked in pure turpentine and placed under a guinea pig's skin, it will be found that, even after a lapse of twelve hours, not a single amœboid cell has penetrated into the sponge. Sections made through the sponge and surrounding parts show that the amœboid cells have emigrated in considerable numbers into the tissues around, but that they are arrested at a certain distance from the sponge and can proceed no farther. A piece of normal sponge placed a little distance off, is absolutely crammed with amœboid cells, though the turpentine sponge contains none at all.

"Now allow a similar sponge to soak in a very dilute solution of turpentine in olive oil, and place this sponge, together with another containing fine sterilized olive oil, and a third soaked in pure turpentine, under the skin of a guinea pig. After four hours, the sponge in the solution of turpentine in olive oil is crammed with amœboid cells, while the other sponge soaked in olive oil, contains but a few, and that in turpentine, none at all. Here, then, we have the same substance exhibiting totally different effects according to the concentration with which it is applied. It is very probable that such is the case with bacterial poisons also, and there are already some experiments which support this view. Moreover, as Dr. Woodhead has already pointed out, the same substances which in a non-resistant animal repel amœboid cells, attract these same cells in considerable numbers when the animal has been artificially protected."

As regards the theory of Dr. Klein, that leucocytes, instead of being the destroyers of microbes, are selected by them as favorable places for their development, or as places for refuge, Dr. Ruffer very aptly remarks: —

"With regard to what takes place in the internal organs, the only evidence in favor of this theory is that micro-organisms are often found in cells. But I contend that this is not sufficient. Should one meet a dead lion and find a lamb inside, he, knowing the habits of the lion, would not conclude that the lamb had taken refuge there. True, after a surfeit of lamb, the lion might die of indigestion, but the chances of the lamb ever getting out alive would be very small. Similarly, knowing the voracious habits of the lymphoid cells of the internal organs, before we can accept this theory, observations must be made showing that the bacilli of their own accord force their way into the cells; explanations must also be found for the fact that the micro-organisms perish in the cells in enormous numbers; and lastly, it must be explained why, according to Bardach, Soudakewitch, and others, animals normally resistant against a given microbe succumb almost invariably when the spleen is removed.

"Remember also, that phagocytes exert a distinct choice between two kinds of microbes. They will leave the bacillus of tetanus for the micro-bacillus prodigiosus, and the streptococcus for the bacillus of diphtheria. This is well illustrated in the diphtheritic membrane, where at the surface one can see leucocytes taking in numbers of bacilli, but leaving streptococci almost untouched, with the immediate result that streptococci are often met in the deeper parts of the membrane, and with the remote result that secondary abscesses occurring in the course of diphtheria are never due

to the bacillus of diphtheria, but to some other micro-organism.

"The study of the diphtheritic membrane shows the remarkable resisting powers of leucocytes, for although the tissues underlying the membrane are necrosed and dead, the leucocytes have the power of marching in numbers right up to the bacilli and waging war against them, although many, as I have shown, perish in the fight."

Respecting the reputed bactericidal property of serum, Dr. Ruffer makes the following interesting observations: "Some investigators, the chief of whom is Dr. Buchner, of Munich, have laid great stress upon the bactericidal action of the serum of resistant animals. I may perhaps be permitted to express my great admiration for Dr. Buchner's work and that of his followers, and I am ready to allow that the facts, as stated by Dr. Buchner, are in the main correct; but I am far from accepting the view that the fluids of the living animal play any part in the destruction of microbes in the organism.

"In the first place, let us see what happens in animals which have undergone no protective treatment. If the bactericidal action of normal serum has anything whatever to do with the resistance of animals toward a particular kind of microbe, then whenever the resistance of an animal against a given microbe is great, the bactericidal action of its serum on that microbe should also be marked; and that when an animal is not resistant, the bactericidal action of its serum should be feeble, or at least slighter than that of a more resistant animal. A rabbit is not resistant, and its serum possesses a strong bactericidal action on the anthrax bacillus; a dog is more resistant, and its serum has no bactericidal action on the anthrax bacillus. We have one exception, that is the white rat, which possesses considerable resistance against anthrax, and the serum of which has a strong bactericidal action on the bacillus anthracis *in vitro*. But this exception proves the rule, for when the bacillus anthracis is inoculated into a white rat, it thrives at first remarkably well, though it is ultimately destroyed by the animal's amœboid cells. That teaches us another thing also, namely, that it is impossible to argue that those phenomena which occur *in vitro* exclusively, take place in the living body.

"Were other examples necessary, I would draw attention to the fact that, *in vitro*, the serum of the non-resistant rabbit is a bad cultivating medium for the bacillus pyocyaneus, whereas the serum of the resistant guinea pig is an excellent cultivating medium for the same bacillus. And conversely, I would point out that the serum of the resistant rabbit is an excellent cultivating medium for the bacillus of Chauveau, and that of the non-resistant guinea pig a very bad medium for the same micro-organism. Moreover I have proved that the fluids of both kinds of animals when alive, form an excellent cultivating medium for this same bacillus. And yet another example of a similar nature: The bacillus of diphtheria in most animals is only found at the seat of inoculation, and in rabbits and guinea pigs never spreads any farther; and yet the serum of such animals is an excellent cultivating medium for the bacillus of diphtheria."

The Toxic Nature of Normal Urine. — A number of experiments have been made by Bouchard, and since, by some other investigators, on the toxicity of urines in various conditions. This is one of the most fruitful fields of the investigator,— to determine the causes and nature of a number of diseases, and everywhere in civilized countries we find men engaged in the laudable task. F. Sydney Edkins makes the following statement in the Manchester (Eng.) *Medical Chronical*, which is of a great deal of interest: —

MM. Mairet and Bosc (*Archives de Physiologie*, April, 1891) refer to the fact that the toxic nature of the urine has been ascribed to various particular constituents, without satisfactory evidence. The urea, kreatinin, the sodium chloride, and the potash salts have severally been designated as the essentially poisonous elements. Their researches have been in the direction of discovering the part played by the water, by oxidation products, by mineral salts, and by coloring matters.

"Their experiments were performed on dogs and rabbits. The method of introduction of the particular substances into the animal's circulation was by intravenous injection, and the introdnction was gradual, the whole quantity injected being spread over a certain interval. They found the injection of simple urine to

have the same effects as had been previously described by Bouchard,—some amount of contraction of the pupil, a considerable secretion of urine, slowing of the respiration, and a quickening of the heart-beat. The temperature was unaltered. As regards the nervous system, some degree of somnolence was at first noted, and later, coma and an epileptic form of convulsions. Finally, the animals died. Comparing the effects with those obtained by the injection of the different substances referred to above, they obtained the following results: —

"After the injection of a certain quantity of water the animals died. [Both spring and distilled water were used with the same result.] The deaths in this case they referred to the mechanical effects. They found, as would be expected, nothing to indicate any toxic nature so far as the water was concerned.

"To obtain a material containing the oxidation products and the salts, they decolorized urine with charcoal, and used this fluid. They also used separately urea, and sodium, and potassium salts. They concluded that the salts of potassium had some slight poisoning effect; that urea and the salts of potassium and sodium promoted diuresis, and that the accelerated heart-beat was to be referred to the sodium salts. They then addressed themselves to the coloring matters, which they isolated and injected as before, intraveneously. They found that the injection of the coloring matters by themselves had very much the same result as the injection of urine. They caused contraction of the pupil, diarrhœa, abundant secretion of urine, slowed respiration, and accelerated circulation. A state of coma supervened, and convulsions were observed. They therefore conclude that the coloring matters are the essential cause of he toxic nature of urine."

Chimiotaxic Value of Tuberculine. — M. Freudenreich, in the *Annales de Micrographie*, gives a *résumé* of the studies of M. Enrico Burci (*Riforma Medica*, Nos. 239 and 240, Oct., 1891), on the subject of tuberculine. Among other important conclusions, we note: —

1. Koch's lymph exerts a moderately attractive action on the leucocytes and on the migratory cells of the connective tissue.

2. The chimiotaxic action of the lymph is moderate in guinea pigs, a little more marked in rabbits, and still more marked in dogs.

3. Its chimiotaxic activity seems more marked on tuberculous guinea pigs at the seat of tuberculous growth.

4. An injection of lymph preceding the introduction of capillary tubes (filled with lymph and introduced under the skin in order to study their contents at various intervals) does not modify the results.

5. After an injection the number of migratory elements in the seat of tuberculous growth is augumented. It is the more marked that the inoculation is nearer to the seat of the disease.

Analysis of Milk by Electricity. — The *Chemicher Zeitung* describes a new method of analysis of milk, which is based upon the variation of resistance presented by milk, according as the proportion of fatty matters or of water is increased. The variation in resistance may be controlled by the addition of inorganic salts, but this only adds another difficulty which those who undertake to adulterate milk must meet, as without skilled assistants it would be practically impossible to arrive at just the right proportions required to meet the demands of the test.

Arrowhead Poison. — M. Le Dantec recently reported to the Society of Anatomy and Physiology, of Bordeaux, the results of experimental researches made by himself in relation to the nature and origin of the arrowhead poison employed by the natives of New Hebrides. He showed by experimentation that the poison was of neither vegetable nor animal origin, that is, neither curare nor serpent venom. A bacteriological investigation showed the poison to contain microbes which could be cultivated indefinitely. The poison is obtained from the earth found in bogs, and investigation showed that it contains a septic vibrio, and the tetanus bacillus of Nicolaier. This observation seems to completely refute the views heretofore held respecting the equine origin of the bacillus of tetanus, since the horse is absolutely unknown in the archipelago of New Hebrides.

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

The Bacillus of Typhoid Fever and the Bacillus Coli Communis.— Messrs. Rodet and Roux have made extensive experiments to demonstrate the direct relations between the two organisms mentioned, and have come to the conclusion that the typhoid bacillus is only a degenerated variety of the bacillus coli communis. They do not state, however, that the bacillus coli communis produces typhoid fever, but that it may acquire typhogenous properties.

Messrs. Chantemesse and Widal, on the contrary, have arrived at the conclusion that the Eberth bacillus of typhoid fever is different from the bacillus coli communis. They bring forward serious arguments against the theory of Rodet and Roux. Investigators in this country (notably Welch) also attack the Roux theory very boldly. It seems pretty well established that the germ of typhoid fever is a different organism from the bacillus coli communis. Another investigator, Prof. Vaughan, attributes typhoid fever to several germs.

Germs of Oleomargarine.— Drs. Scala and Alessi, of Rome, have recently published the results of some studies undertaken for the purpose of determining whether disease may be transmitted by means of artificial butter. The following *résumé* of these results was published recently in the *Revue Internationale de Medicin* : —

"The spore-producing bacilli of charbon, the staphylococcus pyogenes aureus, streptococcus, and the bacillus of glanders, in both filtered and non-filtered butter, resisted a temperature of 104° to 122° F., for two hours. The streptococcus pyogenes and bacillus of glanders alone perished in the filtered butter. Further, the bacilli of charbon retained their vitality in non-filtered butter for 46 days, but only 28 days when the butter was filtered. All the other germs disappeared at the end of 30 days. The spore-producing bacilli of charbon retained their pathogenic properties for more than 30 days in filtered butter, and for an indefinite period in butter which had not been filtered. The streptococcus pyogenes is no longer pathogenic after having been subjected to the temperature above indicated in filtered butter, but remains pathogenic under the same conditions, if the butter has not been filtered. The bacilli of glanders did not produce death in the experiments made, but one death resulted from the bacilli of tuberculosis.

"The author recommends that artificial butter should never be used within less than 40 days after its manufacture, the time that should be allowed for the disappearance of the most dangerous germs."

The advice given by the authors of the above experiments is certainly good, but we would suggest the propriety of considering carefully the question whether it would not be better still to make no use whatever of a food-substance so extensively contaminated.

Staphylococcæmia.— This is a term applied to investigations of the system by the staphylococcus albus or aureus. M. Stenico, of Florence, reports a case in which this malady appeared as a disease. The patient was affected with intermittent or febrile attacks, resembling tertian malarial paroxysms. The spleen was swollen and the lungs congested. Quinine administered by the mouth had no effect. Microscopic examination of the blood showed the presence, during the intervals between the febrile attacks, also when the fever was present, of great numbers of micrococci. The micrococci were also found in the urine. Cultures made with the blood and urine upon agar and gelatine resulted in the development of colonies in the staphylococcus pyrogenes albus and aureus. Patient was cured by intra-venous injections of a solution of quinine, from which cause the staphylococci began to disappear.

The Action of Mineral Filters on Microbic Fluids.— M. Arloing, in a note to the French Academy of Science, June 20, gives his experience with mineral filters as used in filtering liquids of microbic origin. He points out that chemists have demonstrated that these filters retain a certain quantity of albumi-

noid matters, chiefly diastases. He himself saw a few years ago that microbic products with a phlogogenous property, lose part of their activity in passing through Chamberland's filter. M. Roded and Courmont have made similar observations on the toxic property of culture broth. Now that researches on the products of microbes are in order, M. Arloing thought that it would be of utility to demonstrate the changes which the filters produce in the proportions of the different substances serving as media for microbic life. In his experiments he selected a liquid which runs from the pulp of the sugar beet after its fermentation in a silo. He found that a mineral filter contained a greater quantity of definitely insoluble than soluble substances, after the action of alcohol. He demonstrated that the Chamberland filter impoverishes the liquids that are filtered through it. It abstracts from them a notable quantity of nitrogenized and hydrocarbonated organic substances.

The Cause of Immunity, and the Cure of Infectious Maladies.— M. Emmerich has observed that the bacilli of hog cholera, introduced into the organism of vaccinated rabbits, are rapidly destroyed, and cannot be found eight hours afterward in the organs. He attributes this fact to the formation of poisons having bactericide properties. M. Metchnikoff attributes the destruction of bacilli in such cases to the action of phagocytes. M. Emmerich and M. Metchnikoff, consequently, have very different views of the cause of immunity, and the discussion has been carried on, on the part of the former at least, with considerable bitterness. He has made new experiments, in which he claims that his first observations have been absolutely confirmed. He concludes by saying that the refractory organism "destroys the bacilli introduced by injection in the veins in eight to ten hours, even when they are injected by the million." He says the phagocytes play no role whatever in the production of immunity, and presumes that it is the poison contained in the tissue of the vaccinated animal which kills the bacteria. He goes much further and says that the phagocytes may favor infection by transferring the germs from one part of the body to another.

It is strange that this observer finds results so strikingly different from the views of M. Metchnikoff, which are supported by so many facts. However, it seems that phagocytes are not the only factor in producing immunity; they are simply one of the means to that end.

The Etiology of Suppuration in Tuberculosis.— The writer has always held the view (based on experimental labors and other observations) that tuberculosis is generally complicated by the action of various microbes. Suppuration has often seemed to be the result of other microorganisms than the bacilli of tuberculosis. However, the experiments with Koch's tuberculine demonstrate very well that cultures of tuberculosis, killed by heat, produce local abscesses when they are inoculated under the skin of the guinea-pig. The same thing is produced in tuberculosis provoked experimentally; an abscess generally takes place at the point of inoculation. There is nothing strange in this since a number of other known germs may produce similar effects.

In order to elucidate this question, Dr. Tavel made a series of observations in forty cases of abscesses presenting the character of tuberculosis; he made in each a complete bacteriological analysis, and also tested these abscesses by inoculation. Dr. Tavel derives from his important work the following conclusions: 1. In man tuberculosis of hæmatogenous origin is a mono-infection produced by the bacilli of tuberculosis exclusively; 2. Mixed infections generally proceed from the exterior; 3. When other bacteria are found in abscesses which had no connection with the superficial parts of the body, there are generally no bacilli of tuberculosis; 4. A predisposition of the tuberculous spots to a hæmatogenous infection is not proven; 5. Clinical experiments and the results of the inoculation of guinea-pigs, seem to demonstrate that tuberculosis does not exert a prohibitory action on pyogenous bacteria.

The writer has long studied this question, and from observations and experiments, has become convinced that tuberculosis is very frequently, if not usually, at some period or another, complicated by the action of other organisms. The latter generally appear after the tubercles have opened.

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ETIOLOGY OF SPECIFIC DISEASES.

STILL the discussions continue on the subject of this headline, and while the bacterian theory, so-called, is accepted by a majority of the medical world, we find theorists who advance very different views. The *bioplast theory;* the *chemico-physical theory;* the *nervo-glandular theory*, and the very elastic theory, given under the name of "*perverted vital force,*" are among the notions of the medical fraternity.

The latest important dissertation on the subject is by Dr. R. French Stone, of Indianapolis (before the section of the practice of medicine of the American Medical Association, Detroit, June 7, 1892). Dr. Stone's paper is admirable and thoughtful, yet it cannot be said that anything more than theoretical ideas, unsupported by exact science, have been advanced. Like other antagonists of bacteriology, and supporters of different theories, he constructs a plausible groundwork, on pure speculations, to support his views, but when the light of science is applied to it, it is found wanting.

Actual experiments have, repeatedly, annihilated most of the plausible features of each and all these theories, while not one of them brings forth a single experiment or proven fact to disprove the more exact teachings of bacteriology. The fact is, that all the theories mentioned which are not bacterian, can be explained scientifically, by observations, and often by experimental demonstrations in the bacteriological field. They are only so many poorly explained phenomena which do not militate against bacterian etiology, but, for the most part, actually support it, and explain to the scientist many of the problems which appear darkest to the medical profession. For example, the *chemico-physical* theory is not capable of explaining, of itself, any specific disease, while as a factor in the bacterian doctrine it supports the latter and explains the chemico-physical phenomena at the same time.

The "*perverted vital force*" theory is in the same condition; it simply supports the "germ theory," so-called. No bacteriologist worthy the title, maintains that bacteria can produce disease in any organism without a *proper field* for its development. The perversion of vital force is simply a special condition of the soil which offers a proper nutrition for microbes. No matter how long or how much the soil is "perverted," it cannot produce a specific disease, say, typhoid fever, unless the specific germs are there to grow. The latter are the last and determining factors. A piece of land may be perverted, *i. e.*, rendered fertile, by decomposition of organic matter on its surface or in its external strata, but even in this most favorable condition, it cannot grow wheat without the wheat seed; the transformation and exhaustion of soil peculiar to wheat-growing cannot take place until the development of this plant. So it is in a specific disease; the body is the soil; the germ the plant. The body may be called perverted when its forces are exhausted or weakened, and the tissues offer then a rich nutrition to germs, without the normal life resistance of healthy living cells.

But this *perverted vital force* theory could not explain all specific diseases even if it could explain any of the most obscure ones which offer such a rich field for speculators; there are specific dis-

eases which do not wait for a perverted vital force, for example, charbon. It does not matter in what condition a susceptible organism is, it is usually liable to the accidental transmission of charbon; one can always produce this disease by inoculation (not necessarily with a mixture of germs and their products) with the bacilli of anthrax pure and simple, entirely free from other matters, as may be readily done by filtration, washing, and comparative inoculation of free germs and the liquid which has served to wash them. Can this be explained theoretically or experimentally by any theory except the doctrine of bacterian etiology? On the contrary, to one who has himself made these experiments, it solves the errors which theorists are laboring under in their futile attempts to establish unscientific suppositions. The bacterian doctrine is established, both in animal and plant diseases, and "our present state of knowledge" is *not* "an unsettled problem."

Dr. Stone's article is ingenious, and arouses most serious thinking; but not a single problem in all its arguments and suggestions is beyond reasonable explanation by bacteriology, even now, in its crude state. The many difficulties painted by Professor Hartshorn, of Philadelphia, and expressed by Dr. Stone in seven special paragraphs, have been time and again reasonably elucidated by different observers and experimentalists the world over; indeed some of them are elementary questions already antiquated.

In one statement Dr. Stone makes the bold assertion that glanders is "only of spontaneous origin, etc." This is absolutely inaccurate, if he means that in lower animals it ever arises spontaneously without the germs, as his preceding remarks surely indicate, and almost positively declare. The writer of this criticism had for many years control of the contagious diseases of live stock in the State of Missouri, under a special sanitary act. During this time he has seen over eight hundred cases of glanders; has made over one hundred and fifty *post-mortems* in the equine species; inoculated the disease repeatedly in guinea pigs, and has studied the results in various stages; has studied the history of almost every one of the eight hundred cases, and also of some eight cases in man, some of which he saw and diagnosed; has studied glanders during five years microscopically and bacteriologically, and he can say that never does glanders originate *any where* and in *any condition* without the introduction of the specific germ. Such assertions are well calculated to detract from the importance which one might attach to the other assertions of the paper, and the many arguments and speculations indulged in. P. P.

THE SURGICAL TREATMENT OF RETROVERSION OF THE UTERUS.

The frequency and incurability by non-surgical measures of this morbid condition is evidenced by the enormous business carried on by firms engaged in the manufacture and sale of pessaries of every description. That pelvic pessaries rarely if ever effect a cure of retroversion, is a fact with which all practitioners are familiar. Nevertheless, so many failures were reported in connection with attempts to relieve this condition by means of the present device, by Prof. Alexander, of Liverpool, that the majority of practitioners have relapsed into the old condition of what might be termed "innocuous desuetude," in relation to this malady.

Perhaps the majority of gynecological surgeons are to-day considering the method of shortening the round ligaments, as a means of correcting posterior displacement of the uterus, and, upon failure, various methods have been proposed as a substitute for it, such as stitching the fundus of the uterus to the anterior abdominal wall, attaching the

pedicles of the appendages after ovariotomy to the bottom of the wound, folding the round ligaments in various ways, attaching them to the abdominal wall, etc.

None of these methods have, however, met with general approval, and all are confessed to be, practically, failures by those who have had an opportunity to observe the results obtained.

A question of interest to progressive physicians, is: Must women suffering from retroversion now be abandoned to their fate, or subjected to the ultra-radical method of vaginal hysterectomy, to which a few surgeons have resorted as a last and, we may perhaps say, desperate means of relief.

In the opinion of the writer, the abandonment of the method of shortening the round ligaments has been too hasty. A careful study of the subject seems to show that failures were due, not to any fault in the principle involved in the operation, but rather to defective methods, and to an employment of the operation in cases requiring more serious operative measures, such as a laparotomy for the breaking up of the adhesions, or the removal of the diseased appendages.

The difficulty of determining the exact condition of the uterine appendages without opening the abdomen, must inevitably lead to occasional errors in diagnosis; nevertheless, by the exercise of every possible care and painstaking in diagnosis, it is certainly possible to eliminate the greater proportion of cases unsuited to the operation, and the writer has proven, by the employment of the operation in nearly 200 cases, that the substitution of better operative methods, and the application of proper therapeutic measures before and subsequent to operation, together with care in diagnosis, render this operation not only safe and radical, but a reasonably certain method of curing this most distressing ailment.

A simple incision, scarcely an inch in length, often less than three fourths of an inch in extent, reaching only to the tendon of the external oblique muscle, enables one possessed of skill and experience to penetrate the roof of the inguinal canal near the internal rim, by a small puncture with the point of an operating knife, and then dextrously to hook up the round ligament with an instrument made for the purpose, and quickly weave the ligament into the adjacent tissues, so as to secure it, weaving the loop of surplus ligament into the tendon of the external oblique muscle. The wound may be closed with a couple of silk or catgut sutures, and the operation is done. The writer has often completed the operation on one side in four to six minutes, and on both sides in less than a dozen minutes. The operation is so slight, and may be so quickly completed, that it is even possible to operate without the use of a general anæsthetic, an injection of a small quantity of a 4–8 per-cent solution of cocaine being sufficient to render the patient almost completely oblivious to sensation of any sort during the operation.

After having tested this mode of restoring the uterus to a normal position in nearly 200 cases, extending over a period of five years, the writer feels justified in urging that the method of Alexander, reinforced by greater care in diagnosis, and by an improved technique, shall have a longer and better trial before it is abandoned, feeling confident that such a trial will result in the verdict that this method is, of all that have been proposed, the most suitable for application, at least in those cases which do not require a laparotomy for other reasons. And even in cases in which the abdomen is opened, the writer has generally found that shortening the ligaments by external incisions is the best means of permanently fixing the uterus forward in the pelvis, in cases requiring any sort of surgical interference for this purpose.

J. H. K.

The Increasing Prevalence of Tapeworm.—French physicians have been considerably agitated over the fact that while the population of that country is rapidly decreasing in consequence of an increased death-rate acting in conjunction with a decrease in the birth-rate, tapeworms are rapidly increasing. There has been considerable discussion as to the source of the tapeworm so commonly met with, especially on the Belgian and Swiss frontiers, and the Mediterranean shore.

Berenger-Feraud maintains that tapeworm is chiefly derived from beef, while M. Colin insists that the pig and the cow are equally prolific sources of this parasite. He claims to have discovered, also, that both these animals are infected by some species of cysticercus, so that it is impossible to tell by examination of the worm whether it is derived from the cow or the pig. M. Colin also calls attention to the great frequency with which cysticerci are to be found in the flesh sold in the public markets.

If a similar investigation were made in this country, it would doubtless show that tapeworm is increasing in the United States with fully as great rapidity as in France, since there is practically no system of meat inspection in this country capable of protecting, even to a slight degree, more than a very small proportion of the population. The consequence is, that not only is the flesh of animals infected with the embryos of tapeworm, frequently eaten, thus establishing the disease in human alimentary canals, but infected persons are going about scattering the eggs of the parasite by the million, infecting water-courses through sewerage systems, and thus rapidly multiplying the disease in domestic animals which are used for food, so that a vicious circle is formed, by which the disease is bound to increase more and more.

This is only one of the grave questions relating to the food-supply, and it should be seriously considered by our legislative sanitary authorities, for it is certainly one which demands immediate attention. J. H. K.

Earthworms and Tuberculosis.—Lortet and Despeignes recently reported to the Academy of Science, Paris, some very interesting studies in relation to the function of earthworms in the dissemination of tuberculosis. These authors had previously shown that earthworms may preserve in different parts of their bodies, the bacilli of tuberculosis during many months, and that they may thus bring them to the surface of the soil. Recently these scientists have extended their researches in this direction, and have determined the important fact that earthworms that have become infected with tubercle bacilli leave behind them in their fæcal matters, as they move through the earth, tubercle bacilli possessed of virulent properties.

Pasteur called attention to a similar action of earthworms in relation to the bacteria of charbon, many years ago. It is of interest to know that the bacilli of tuberculosis sustain the same relation to earthworms as that of charbon. With these facts determined, it is easy to appreciate how a locality may become infected with the germs of tuberculosis. Earthworms harboring the microbes in their bodies, scatter them about through the soil, and bringing them to the suface, where the excreta containing them may be dried and pulverized into fine dust and lifted into the air in the shape of minute particles which may be readily inhaled, it is easy to see how a locality once inoculated with tuberculosis becomes permanently infected.

The purpose of this arrangement of nature in the seeming co-operation of organisms of a low type against human life, is indeed difficult to comprehend. The fact, however, is one of importance, and should lead to the absolute destruction of

the sputum in every case of tuberculosis. There ought to be a law in every civilized community requiring every person suffering from tuberculosis to destroy his sputa, as it is chiefly through this means that the disease is extended.

Nearly a century ago, the prevalence of tuberculosis in Naples led to the establishment of a quarantine against the disease, similar to that which is maintained against leprosy in countries where this latter disease prevails. Known facts about the two diseases indicate that pulmonary tuberculosis is a more infectious malady than leprosy. Its ravages are more rapidly fatal in their effects, and recovery from the disease, when it has once obtained a foothold in the system, is almost as rare. A malady which destroys from one fifth to one seventh of all that die is a veritable plague of the most stupendous proportions; so that how to restrict or restrain this disease, is one of the gravest problems with which the sanitarians of the present day are called upon to deal.

J. H. K.

A Higher Standard of Medical Education.— It is gratifying to note in many different quarters the growing sentiment in favor of a higher standard in medical education. The University of Michigan has, in this respect, set a worthy example for the large number of medical schools in the West, and it is interesting to note that although the standard requirements for entrance at this excellent school have been gradually raised from year to year for a number of years back, the attendance has not fallen off. This fact points to an appreciation on the part of the profession, of the importance of the advances made. The Legislature of the State of New York has recently created a law requiring a State examination of all graduates in medicine. It is rather humiliating to learn that a bill has recently been brought before the Legislature, exempting from all the requirements of the previous bill relating to examinations, all medical students who have entered upon their studies within a year from the passage of the bill. It is certainly to be hoped that this exemption bill will not become a law. The too rapid increase of medical men in this country gives rise to the employment of unfair and often disgraceful means of competition among them, and leads to the adoption of commercial methods which are a disgrace to a noble profession. Any and every measure looking toward the lessening of the annual output of doctors by medical schools, and improvement in the quality of instruction imparted, and the raising of the standard both for admittance and graduation, should be welcomed by all who have the interests of the profession at heart.

J. H. K.

Metchnikoff on Vaccination.— The interesting work recently done by Metchnikoff in relation to the subject of immunity, and described by himself in this journal, lays the foundation for a broad field of research in relation to this most important question, and offers a hope for most remarkable results. The question of immunity has been one of the most puzzling with which physiologists and biologists have had to deal. To Metchnikoff is properly attributable the honor of having been the first to throw any real light upon this important question. His profound and exact researches have developed original facts of the most intensely interesting character, and which thus far seem to have well stood the test of the most severe criticism to which they could possibly be subjected. It is to be hoped that this *savant* will be able to continue his researches until this knotty question is fully elucidated, and until the means have been acquired by which many of the maladies which now make such havoc with human life may be brought under control by the prophylactical measure of artificial immunity.

J. H. K.

REVIEWS.

"Original Researches Concerning Tri-Methyl-Xanthine and its Derivatives."— By Moses Gomberg, M. S., University of Michigan.

Through the kindness of the author, we have received an abstract of a paper prepared by him, giving the results of an extended series of chemical studies having for their object the determination of a constitutional formula of caffeine. The results obtained seem to confirm those obtained by E. Fisher.

The original observation made by Lehmann respecting the close resemblance of caffeine to creatinin, one of the excrementitious products of tissue-work, seems to be confirmed by later studies of this substance, although this fact is not referred to by the author, whose sole purpose was to determine the chemical constitution of this interesting substance. Mr. Gomberg certainly deserves great credit for the painstaking, investigation which he has made, which not only confirms the observations of other eminent chemists, but add something to what was previously known respecting caffeine and its compound.

"Parasites and Parasitic Diseases of the Domesticated Animals."— By L. G. Neumann, Professor at the National Veterinary School of Toulouse. Translated and edited by George Fleming, C. B., LL. D., F. R. C. V. S. 8vo, cloth, 873 pages, 365 illustrations, $8. William R. Jenkins, 851 and 853 Sixth Avenue, New York. In 1876, realizing the need, in the English language, of a work to which the student of human or veterinary medicine, the sanitarian, agriculturist, or breeder or rearer of animals, could refer for full information, with regard to the external and internal parasites — vegetable and animal — which attack the various species of creatures man has domesticated, Dr. Fleming commenced a work to meet the want, but, owing to a pressure of other duties, was compelled, temporarily, to relinquish this task. In 1888 Neumann's treatise was issued, and that being the most complete and comprehensive of any which had yet appeared, and the arrangement somewhat on the plan Dr. Fleming adopted, Dr. Fleming resolved to venture on its translation instead of proceeding with an independent attempt.

The result of his efforts is this book. With it, no work in English is to be compared so far as veterinary medicine is concerned; and even in human medicine — English or foreign — there is none so comprehensive and complete.

The damage done to health — the parasitic diseases — the author had particularly in view, and so deemed it useful to establish the order to be followed according to the nature of the organs invaded, and this has been the predominant idea throughout the work.

In order to facilitate diagnosis, the study of the commensals, which are so frequently met with, has been added to the study of parasites. All the living forms observed on the surface or in the texture of organs, whether common or rare, frequent or exceptional, have been included. The work is divided into eight sections, as follows: Parasites of the Skin, Parasites of the Digestive Apparatus, Parasites of the Serous Membranes, Parasites of the Respiratory Apparatus, Parasites of the Circulatory Apparatus, Parasites of the Muscles, Connecting Tissue, and Bones, Parasites of the Nerve Centers and Organs of Sense, Parasites of the Genito-Urinary Organs.

"The Successful Treatment of Chronic Diseases; a Plea for Their More Methodical Management."— By Simon Baruch, M.D., Physician to the Manhattan General Hospital, New York Juvenile Asylum, and Montefiore Home for Chronic Invalids.

This excellent paper, read at the last annual meeting of the Medical Society of the State of New York, contains much food for thought, especially by those who have allowed to pass, without some notice, the many progressive steps which have been made within the last twenty years, in the rational treatment of chronic disorders. The following interesting description of the Dettweiler treatment of consumption at Falkenstein, well illustrates the author's idea respecting the regulation of the entire life of the chronic invalid: —

"Dr. Dettweiler looks with disfavor upon medicinal remedies, and pins his faith chiefly to the curative influence of pure air, to which he exposes his patients, without regard to the rigorous climate in winter even, at all seasons. The discipline of this institution is rigid, and almost military in exacting obedience. At 8 A. M. the patients are expected to be down stairs under penalty of a fine. Then each one stretches himself upon a reclining chair, of which there are a very large number in the large halls, which he leaves five or six times during the morning to take a ten or fifteen minutes' walk. 'Patients are advised to walk slowly, on a gentle slope, with shoulders erect, and every fifteen minutes to fill their lungs to their full capacity by inhaling through the nose.' Breakfast is served, consisting largely of milk, after which the patient returns to his reclining chair, and the rest of the day is passed in the same manner as the morning. Dettweiler is most autocratic among his patients, and teaches them to cough only three times a day. Hence each cough is followed by expectoration, and he never allows them to cough uselessly. At 10 P. M. each one returns to his bedroom, which has remained open the entire day; the window is left partly open the entire night, covered by a light blind.

"No drugs whatever are used at Falkenstein, and still the results are most satisfactory, thirty-seven per cent, including all grades, recovering completely."

A considerable part of the paper is devoted to a description of hydro-therapeutic methods in the treatment of chronic disorders. This paper cannot but be of service to all who are not familiar with the rational employment of hydro-therapy, and suggestive even to those who have had years of experience in the employment of this valuable remedy.

"The Wife and Mother. A Medical Guide to the Care of Her Health and the Management of Her Children." — By Albert Westland, M.A.M., M.D., C.N. P. Blakiston, Son & Co., Philadelphia.

This little work of 282 pages, written by an able English physician, is brimful of interest, well condensed and simplified for the use of the lay reader. It is a work which any physician can with perfect propriety place in the hands of his intelligent lady patients, and in so doing feel assured that the suggestions obtained from it will be of service to him as well as to his patients. The medical education of the laity is a work which has been much neglected by physicians, but which much needs to be done. Quackery and patent medicines will hold their place in public esteem, and charlatans will continue to fatten upon the credulity of the ignorant public until physicians do their duty in enlightening the public mind respecting the functions of the body and the laws by which their activities are regulated. Ignorance is the mother of superstition; superstition is the friend of quackery. In order that men and women shall be able to distinguish between the intelligent and skillful physician and the pretentious charlatan, it is necessary that individuals should possess a sufficient degree of medical knowledge to be enabled to form a correct opinion respecting the merits of the two classes of candidates for public favor and patronage. This little book will contribute to the diffusion of just the kind of information which people need.



WHERE TO SPEND THE SUMMER

AT this Season of the Year, thousands of Invalids are seriously considering the question,—

Where Can I Spend the Months of July and August, and part of September, with the Greatest Profit and Satisfaction?

THE ANSWER

to this question depends on what the individual wishes to accomplish by a summer vacation. If change and recreation only are desired, these can be found in a thousand places—at health and other resorts which abound in almost every State in the Union, none of which, however, excel the delightful resorts of northern Michigan.

If, in addition to rest and recuperation, the invalid needs a careful study of his diseased conditions, and an intelligent regulation of diet, exercise, and all other health conditions,—in other words, scientific health culture, efficiently carried out by the aid of the best known medical means and appliances, thoroughly trained nurses and attendants, and competent physicians,—then the choice between the most desirable places becomes very much restricted. There are certainly few institutions in this country where the needs and desires of an earnest health-seeking invalid can

be satisfactorily met. Such places can be counted on the fingers of one hand, and are, perhaps, little known because of the fact that the managers of such institutions are conducting them in a scientific, and in some instances a philanthropic spirit, and consequently do not employ as a means of winning patronage, the emblazoned advertisements, the truth-sacrificing circulars, and other advertising methods commonly resorted to by the proprietors of mineral springs establishments, bogus sanitariums, and other so-called "health institutions" and quasi-medical establishments, with which the country abounds.

The advertisements of these establishments do not appear in public prints or popular magazines because such advertising is closely akin to quackery, and brings those who employ it into bad company.

The managers of the Sanitarium at Battle Creek, Michigan, many years ago undertook to organize a thoroughly scientific institution which would represent rational medicine in its most advanced form, and would be exactly what it professed to be — an institution where patients are honestly and fairly dealt with, treated at reasonable rates, given kind attention and comfort, and opportunity for the recovery of health under the most favorable conditions. The majority of patients treated in this institution are sent to it by physicians who by personal acquaintance, or through the reports of their patients, have become thoroughly familiar with the character of the institution and its management.

BRIEF DESCRIPTION OF THE SANITARIUM.

BATTLE CREEK, one of the most beautiful and prosperous cities of Michigan, is centrally located in the salubrious Peninsular State. Its population is 20,000, while its death rate is but seven per thousand. Battle Creek is situated on two great thoroughfares of railway travel between the East and the West, being at the junction of the Grand Trunk and the Michigan Central lines; and two other railways make it easy of access from the South.

The city has an electric railway and is lighted by electric lights. A great number of pleasant drives are afforded by its well-kept and shaded streets.

The Buildings are lighted by a 700-light plant, Edison incandescent system.

Safety Hydraulic Elevators. Outside stairways for fire escapes accessible from every window.

The Institution affords facilities for baths of every description: Turkish, Russian, vapor, electric, water baths of all kinds, and the electric light bath. Independent accommodations for ladies and gentlemen, sufficient for 80 persons at one time. More than 800 feet of glass for sun-baths.

A General Parlor, 40 x 50 feet, is luxuriously furnished with Dhagistan rugs, easy chairs, etc. The Dining-Room has a seating capacity of 400, is beautifully lighted and ventilated, and always cheerful. No kitchen smells. Cuisine unsurpassed; table service excellent. Everything an invalid needs, and special dietaries prepared as directed.



VIEW OF GOGUAC LAKE FROM SANITARIUM LAKESIDE GROUNDS.

The Gymnasium, 85 x 45 feet, is supplied with every appliance for exercise, and furnishes special instruction and class drills in Delsarte and Swedish gymnastics, under a trained director. Exercise by prescription.

The Swedish Movement Department, both manual and mechanical, is the most extensive in the United States. Vibrating bars and seats, kneaders, rubbers, beaters, shakers, and manipulating appliances of all sorts.

The Electrical Department contains every improved appliance for medical applications of electricity, Galvanic, Faradic, Dynamic, and Static electrical apparatus and appliances for electrolysis, electro-cautery, etc.

An Aseptic Maternity on the cottage plan (steam heat and thorough ventilation), provides the best possible conditions for lying-in patients, with experienced professional attendance and rigorous aseptic management.

Special Departments for surgical cases, eye, ear, throat, and lung diseases, nervous diseases, genito-urinary diseases of men (non-specific), opium and alcohol habits, and diseases of women. A kindergarten and nursery, to keep the children happy and out of mischief.



SUMMER HOUSE AND FRESH-AIR INLET.

Three Fine Greenhouses, maintaining a magnificent collection of palms and various tropical flowers and plants, keep the house filled with bloom during the winter season. Flowers are everywhere indoors during the winter season. Patients can visit the greenhouse at any time without going out of doors.

Glass-Inclosed Sun-Parlors and Verandas for winter sunning and promenading.

Pure Water from sandstone rock.

There are from 250 to 300 Employes in the Sanitarium service the year round, of whom from 90 to 100 are medical attendants and nurses. Also seven thoroughly trained physicians, and a large corps of manipulators skilled in massage and the Ling system of Swedish movements.

The Sanitarium Training-School, in which our nurses are trained, is the largest and most popular in the United States. Its course of training is the most complete and thorough of any school.

Tri-Weekly Lectures on popular medical subjects by the physicians.

Abundant Means for Recreation indoors during inclement weather. Facilities for walking, driving, and horseback riding at all seasons.



ON THE LAWN.

The Sanitarium is Not a Pleasure Resort nor a fashionable hotel, but an ideal place for invalids needing good nursing, the benefits of regular habits and scientific professional care and treatment, and who desire to get permanently well.

The Sanitarium Nursery and Kindergarten. This enables mothers to bring little ones with them without being burdened with their care and supervision. The children have the advantages of kind and experienced teachers and ample playgrounds.

For Further Particulars, see large circular and card of rates.

J. H. KELLOGG, M. D., SUPT.,

Sanitarium, BATTLE CREEK, MICH.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., AUGUST, 1892.

RELATIVE INFLUENCE OF GERMS AND THEIR PRODUCTS IN THE PRODUCTION OF DISEASE.

THEORISTS indulge in speculation in regard to the etiology of disease, and some even try to destroy the bacterian doctrine by deductions from more or less misunderstood phenomena. One very prolific source of attack on the germ theory is the supposition that it cannot be told whether the germ itself or some of its products causes the disease, or whether it is the "perverted" field in which it grows, which produces disturbances. The arguments of the "*chemico-physical theory*," the "*perverted force theory*," and others, are derived from various misunderstood phenomena of bacterial and animal life which a few well-directed experiments may shatter.

The Director of the Laboratory had occasion some time ago to make direct experiments to demonstrate the part that germs of certain diseases, their products, and the material of their field of growth or culture, play in producing pathological lesions and phenomena. The bacillus anthracis was the first used.

Experiment A.—Cultures on potato, made with charbonous blood from a mule which died from the disease.

Rabbits were inoculated as follows:—

Series 1. Two with a particle of culture virus diluted in ten drops of water.

Series 2. Two with another particle washed in a pint of water and filtered once through a new and clean Chamberland filter bougie, using the germs retained on the filter; and two with thirty drops each of the liquid itself.

Series 3. Two with the germs of a similar particle washed in a pint of water, as above, twice in succession, filtered each time, using the germs on the bougie after second wash; and two with thirty drops of the liquid of this last wash.

Results: Rabbits of series 1 both contracted anthrax and died.

Rabbits of series 2, which were inoculated with the germs retained by the bougie, developed charbon, and died from it, while the rabbits inoculated with the water that served as a wash for them and retained their poisonous products, only produced a mild, temporary illness, with a momentary elevation of temperature—no anthrax.

The rabbits of series 3, which received the germs of charbon from the bougie, after second washing, both developed the malady; one died, the other made a slow recovery. The two rabbits inoculated with sixty drops of the liquid of the last wash failed to develop any disease or fever.

Conclusions: 1. It is the germ of anthrax that produces the disease, not its products.

2. The products are poisonous, and may cause disease in the manner of other chemical poisons, but do not produce the typical and characteristic symptoms of anthrax within the period of inoculation.

3. The assertion that one cannot separate the germ from the products, even by culture, and then establish the action of each, is not well founded; *it can be done.*

4. What is true of this malady must be true of numerous others, and the facts support the bacterian doctrine of specific disease.

Experiments with blood serum of animals having died from anthrax, made on the same principle and by the same methods, give the same general results as do cultures. In the animal organism the germ acts first, and then this action and its resultant transformations and the generated chemical poisons are the factors in producing anthrax.

LIVER FLUKES IN CATTLE.

(Concluded.)

"THE *cercariæ* escape from the snail and encyst on the herbage which is devoured by animals, or they may be taken in the drinking water. They find their way to the liver, where they develop into mature flukes, and thus the cycle of life is completed.

"These changes, or stages, take place mostly during the summer months when mollusks are abundant and other conditions are favorable.

"*Effects of the Parasite.*—The invasion of the liver by the cercariæ is not manifested by unfavorable symptoms. Some observers assert that there is a marked tendency to fatten for about two months. Probably the first thing to attract attention is the death of a few weak lambs early in the fall. The general havoc makes it appearance later, especially during the late winter or early spring. If present in limited numbers no marked deviations from health are noticed. So common are these parasites that it is exceptional to find a liver entirely free from them at any time of the year, and especially so during the spring. Even cattle slaughtered for beef, and in good condition, harbor a few during the entire year.

"If the flukes are present in large numbers, serious damage results. Their presence in the bile ducts in sufficient numbers, obstructs the free passage of that fluid, and therefore increases the tension on the liver cells that secrete the bile; this causes a considerable quantity of the bile to enter the blood, and therefore the animals appear jaundiced.

"The walls of the bile ducts become thickened and are often coated with hard, grit-like crusts. The bile becomes ropy and of a peculiar slimy appearance. These conditions existing, the circulation of the blood is retarded, the animals become pale (anæmic), weak, poor in flesh, and dropsical. The dropsy of the abdomen is considerable and this gives the animal a 'pot-bellied' appearance. Dropsy appears, also, between the lower jaws on account of the position of the head when grazing. This condition is called 'water-jaw.' As the disease progresses, sheep lose portions of their wool. Extreme emaciation and debility follow, and frequently a profuse watery diarrhea sets in, which is usually fatal.

"The symptoms just stated are so conspicuous that stockmen call the disease 'water-jaw,' and 'scours.' In the localities I visited, I received the impression that heifers coming two years old suffered more than those of any other age. Many of these cattle and sheep die, and many of those that recover do not thrive the following summer, but remain poor and weak, and fail to breed.

"On post-mortem examination an enormous quantity of fluid (dropsy) is found in the abdomen, some of which is partly organized. The liver is literally rotten, and in its bile ducts great numbers of mature flukes are found. These, on exposure, extend and retract their bodies like a leech, and eject the dark contents of their digestive tract per mouth. They curl and soon die. Their eggs are seen in the gall and gall-bladder in great numbers. Frequently a few adult flukes are found in the small intestine.

"*Treatment.*—Medicinal treatment is of little value. Some improvement follows the use of tonics, but very little is accomplished. There can be no doubt as to the value of a liberal use of salt. This is suggested by the fact that stock that have access to salt marshes are comparatively free from flukes.

"*Preventive Treatment.*—As the development of the parasite in its various stages depends on the presence of water and water animals, the disease can only occur when stock have access to such stagnant ponds of water as contain the cercariæ, or to grass or herbage that has grown in damp, wet places; it is evident that when these conditions do not exist, the disease cannot occur, that is, the parasite will fail to complete the cycle of life.

"The conclusion is obvious. Cattle and sheep must not have access to infected water holes, but must be furnished pure water.

"A NEW LIVER FLUKE (DISTOMUM TEXANICUM.)

"It is now three years since I saw this animal for the first time. My attention was called to it by a butcher who regarded them as leeches, and desired an explanation of their nature.

"*Description of the Parasite.*—Body flat, liver colored, elliptical or oval, some wider behind than in front, adults 30 to 35 m.m. long, and 20 to 30 m.m. wide. Some very large ones 73 m.m. long, smallest ones 8 m.m. long and 4 m.m. wide. The average specimens about 30 m.m. long. Skin of small and medium sized ones armed with numerous spines or points directed backward. Mature specimens destitute of spines except in patches or scattering ones, especially on ventral surface of body near the outer margin, and then generally large. Mouth terminal, sessile, not on a well defined neck. Ventral sucker large, muscular, 4 to 5 m.m. from preceding. Genital pore midway between the preceding. Penis not always protruding, but when so, curved slightly. Excretory pore small, at opposite extremity from mouth and slightly dorsal. The margin here is sometimes curved from both sides, making it slightly obcordate. Eggs brown, oval, or a little larger at one end, on which there is a cap. Length from 0.14 to 0.16 m.m. Width 0.09 to 0.10 m.m. The digestive tract consists of the mouth, which is made up of circular and radiating muscular fibers in which are situated, in each section, 4 or 5 large nucleated cells. From the mouth proceeds a muscular pharynx, which

suddenly divides, a little anterior to the genital pore, into two main trunks which extend the entire length of the body. These give off from 12 to 16 branches, which give off secondary ones, which terminate in blind pouches, or cæca. The lining of the digestive tract is disposed in finger-like points or projections, somewhat similar to the villi of mammals.

"This parasite is found in the liver tissue of cattle. I have found as many as 27 in one liver; the average number is from 10 to 15. These parasites are found in channels that they have produced. They seem to be wandering aimlessly about in any direction. I think the majority are near the convex or outer surface of the liver. The channels they produce admit the little finger, and these seem to heal or fill up soon after, leaving a red scar. Sometimes they perforate the surface of the liver, then suddenly turn back into the liver again. I think that they sometimes leave the liver and bore into adjoining tissues or organs, but I have not found them in other places than the liver. Having wandered about for some time,

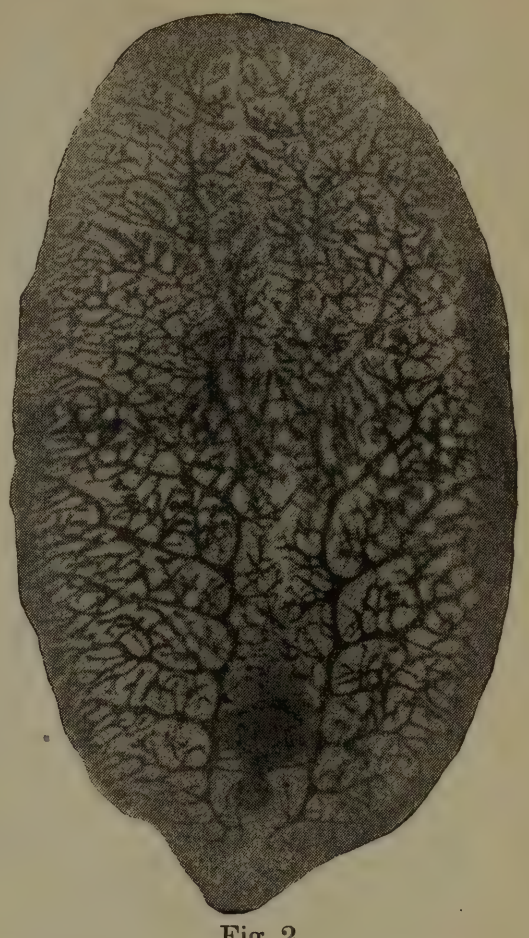


Fig. 2.

they come to rest and encyst themselves. Frequently two have encysted together. Those that are wandering have their bodies covered with spines, while those at rest seem to have lost their spines—their organs of locomotion. When encysted they are always sexually mature. The wall of the cyst becomes dense and tough and is usually coated with a grit-like substance; butchers call such livers 'shelly.' I think they die in these cysts. These cysts contain a very dark, almost black, muddy liquid, which contains myriads of eggs. The gall and gall bladder of such livers are usually normal, and in several instances in which I examined the entire quantity of bile, a very few eggs were found. I think the greatest number was 5 in the entire quantity of bile; but I was not positive that these were the eggs of this animal.

"The life history of this species is unknown.

"From the anatomical peculiarities of this animal one readily recognizes it as belonging to the *Distomidæ*.

"In February, 1891, I sent specimens to Dr. Joseph Leidy, the distinguished scientist, for identification. He did not recognize them as any known species. I have also submitted them to other experts with the same result. On the suggestion of one expert, I have decided to propose the name of *Distomum Texanicum*, as a suitable one."

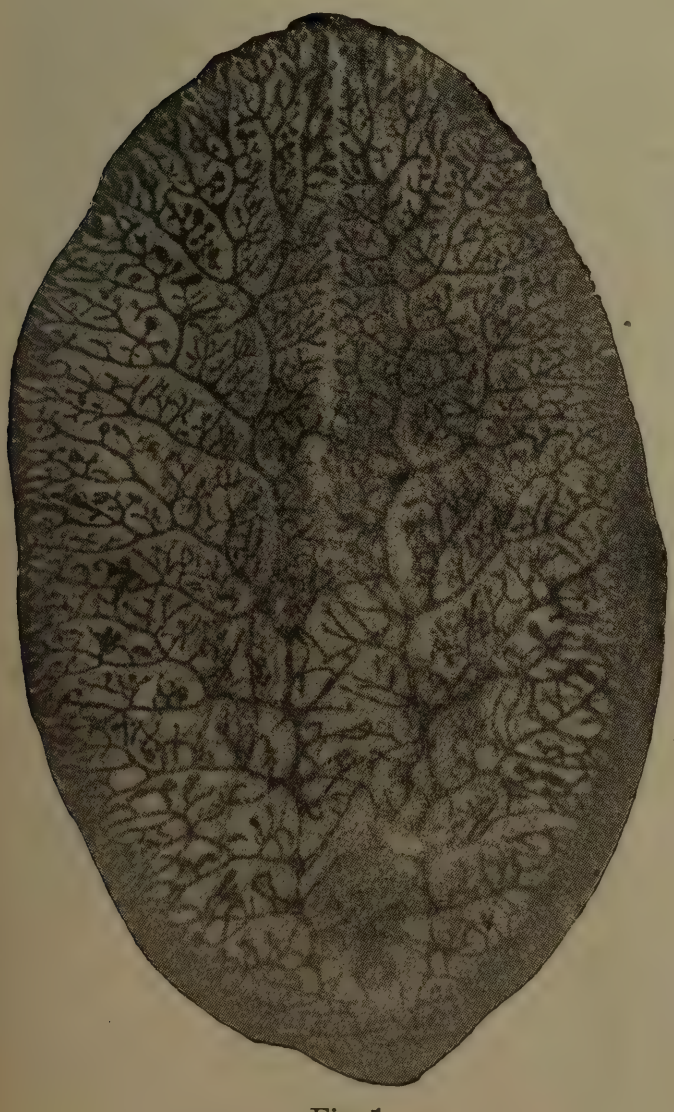


Fig. 1.

Analysis of Stomach Fluids.—At the present time the work of the Laboratory of Hygiene is chiefly devoted to an investigation of stomach fluids. Nearly 200 analyses have been made within the last month, the elaborate and exact method of Hayem and Winter being employed for the determination of the total chlorine, and the different conditions upon which the chlorine exists in the stomach fluid, which is obtained by means of a siphon one hour after a test breakfast.

TECHNIQUE.

How to Extract Griffith's Leucomaine from the Urine of Epileptics.—Take a considerable quantity of urine, produce alkalinity by the addition of soda carbonate stirred in it, and with the further addition of half its weight of ether. After deposit and filtration, the ether is stirred with a solution of tartaric acid, which causes the leucomaine to form a soluble tartrate. The liquid is again alkalinized with soda carbonate, and agitated with half its volume of ether. The etherized solution is allowed to evaporate spontaneously; the leucomaine remains as residue.

This substance is a white matter crystallized in oblique prisms; it is soluble in water; gives a slightly alkaline reaction. It forms a chlorhydrate and chloraurate crystallized. Chloride of mercury forms with it a greenish white precipitate; nitrate of silver, a yellowish precipitate. It gives a white precipitate with phosphotungstic acid; brownish white with phosphomolybdic acid; yellowish with tannic acid. Analyses ascribe to this new leucomaine the following formula: $C^{12}\ H^{16}\ Az.^{5}$

Method of Rapid Staining for Tubercle Bacilli in Specimens Preserved in Müller's fluid.—The method devised by M. Letulle, published in the *Bulletin de la Societie Anatomique*, is as follows: The specimen having been preserved in Müller's fluid and afterward sufficiently hardened in alcohol, may, if necessary, be imbedded in celloidine in the usual manner for making sections. It should then be treated as follows:—

1. The sections taken from the water are treated by hæmatoxylin, which colors the nuclei. Wash thoroughly with water, then pass to—
2. Allow them to remain at least fifteen minutes in a carbolated solution of rubin, which consists of a saturated solution of rubin in a 2 per cent solution of carbolic acid.
3. Rapid washing with water for one minute.
4. One half minute in absolute alcohol.
5. Allow it to remain five minutes in the following solution: 2 per cent solution of carbolic acid, 100 parts; iodine green, one part.
6. Wash with alcohol until the color desired is obtained.
7. Immerse in essence of bergamot.
8. Immerse in xylol.
9. Mount in balsam of xylol.

This method requires less than half an hour, and always succeeds. It shows the nuclei in violet, the hyaline bodies as cherry red, and the tubercle bacilli carmine red upon a field of gray lilac tint.

ANTISEPTIC.
PROPHYLACTIC.
DEODORANT.

LISTERINE

NON-TOXIC.
NON-IRRITANT.
NON-ESCHAROTIC.

FORMULA.—Listerine is the essential antiseptic constituent of Thyme, Eucalyptus Baptisia, Gaultheria, and Mentha, Arvensis, in combination. Each fluid drachm also contains two grains of refined and purified Benzo-boracic Acid.

DOSE.—INTERNALLY: One teaspoonful three or more times a day (as indicated), either full strength or diluted, as necessary for varied conditions.

LISTERINE is a well-proven antiseptic agent—an antizymotic—especially useful in the management of catarrhal conditions of the mucous membrane; adapted to internal use, and to make and maintain surgical cleanliness—asepsis—in the treatment of all parts of the human body, whether by spray, irrigation, atomization, or simple local application, and therefore characterized by its particular adaptability to the field of

PREVENTIVE MEDICINE—INDIVIDUAL PROPHYLAXIS.

LISTERINE

Destroys promptly all odors emanating from diseased gums and teeth, and will be found of great value when taken internally, in teaspoonful doses, to control the fermentative eructations of dyspepsia, and to disinfect the mouth, throat, and stomach. It is a perfect tooth and mouth wash, *indispensable for the dental toilet.*

Descriptive Literature upon Request.

LAMBERT PHARMACAL CO., ST. LOUIS, MO.

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RENAL CALCULUS (Natural Size), Weight 137 Gms. (2109.8 Grains.) Removed by J. H. Kellogg, M. D., Sept. 12, 1892. (See page 357.)

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., SEPTEMBER, 1892. NO. 11.

ORIGINAL ARTICLES.

STUDY OF IMMUNITY.

BY M. METCHNIKOFF.

IV. PREVENTIVE PROPERTY OF THE SERUM OF VACCINATED RABBITS.

We have already shown that the serum of vaccinated rabbits protects rabbits against hog cholera. This result is very constant, and may be obtained not only by injecting serum at the same point as the virulent blood, but also by introducing it at points very remote from the place of inoculation. The rabbits receiving under the skin a quantity of most virulent blood sufficient to kill witness rabbits, and likewise the serum of vaccinated rabbits, manifest only a local suppuration, and surely recover. The serum injected into the veins preserves equally rabbits to which a mortal dose of virus has been inoculated under the skin.

The serum may be injected at the same time or before the introduction of the virus. A rabbit which received thus in the auricular vein, 4, 5, c. c. of serum of a vaccinated rabbit, resisted perfectly an inoculation of O,33 c. c. of virulent blood (a mortal dose for a witness), injected in the subcutaneous tissue.

While the serum of vaccinated rabbits is a very efficacious preventive against subcutaneous inoculation, it only retards death if the virus be introduced into the veins. In an experiment in which the virulent blood was injected into the auricular vein, the rabbit which had received 3, 5 c. c. of vaccinal serum, died in forty-two hours, while the witness which had not been treated with the serum died in five hours and twenty minutes. The injection of a stronger dose of serum would, perhaps, have acted in a more efficacious manner.

The minimum dose of serum necessary to prevent death (after the subcutaneous injection of virus) is O,5 c. c. In an experiment in which I used only O,25 c. c., death was not prevented, but it occurred five days after that of the witness.

All the rabbits vaccinated against hog cholera furnished vaccinal serum. The serum obtained from blood withdrawn a short time (five days) after the proof inoculation, is itself as active as that withdrawn at more advanced periods.

The vaccinating property of the serum depends more on the quantity of toxines injected into the vaccinated rabbits than the really refractory state of the latter. I deduct this conclusion from a few observations which I have been able to make in the course of my researches. I have seen rabbits vaccinated with doses more than sufficient (4 c. c. of toxic blood), which had resisted the proof inoculation, die finally with evident signs of general infection of the microbe of hog cholera, and still their serum, withdrawn a few days before death, was so active that O,5 c. c. sufficed to preserve a rabbit against mortal infection with virulent blood injected subcutaneously.

On the other hand, rabbits cured of hog cholera by treatment with serum of vaccinated rabbits, furnish themselves a serum which does not interfere with the mortal malady in other rabbits. Notwithstanding this, the cured rabbits above mentioned have acquired immunity against other virulent virus.

The efficacy of the serum of vaccinated rabbits not totally refractory against hog cholera, is evidently due to previous injections of sufficient quantities of toxic blood.

The attempts at treatment with preventive serum of rabbits inoculated previ-

ously with virus have not been numerous. They have not given me, as yet, any positive results, probably because of the rapidity with which hog cholera evolves in rabbits.

In multiplying these researches, we might perhaps obtain better success, but the study of this problem did not enter into the plan of this work; it has been reserved for later efforts.

The experiments for the prevention of the malady by means of serum sufficed, of themselves, to demonstrate the efficacy of this liquid when coming from the organism of vaccinated rabbits.

But as the serum is a very complicated mixture, which cannot be identified with the blood plasma, it would be interesting to have a more precise idea of the preventive role of each of its constituting parts. Unfortunately, it is impossible to separate the diverse elements of the blood of rabbits, so the problem cannot be solved under the present scientific methods. We cannot, then, know whether the preventive substances of the serum come from the plasma or the cellular elements. Concerning the latter, I will mention that the blood of vaccinated rabbits is richer in leucocytes than the normal blood.

With the object of contributing to the enlightening of the problem, I have made a few experiments with the liquid of œdema provoked by stopping the circulation. At the base of the ear of three vaccinated rabbits (the serum of which had plainly manifested its preventive properties) a rubber ring was placed. The following day the ear was found hanging, swelled by the œdema. The œdematous liquid was easily gathered in sterilized pipettes. It was absolutely transparent, colorless, and contained only an insufficient number of leucocytes. By the same processes, I have been able to extract œdematous liquid from three witness rabbits not vaccinated.

The œdematous liquid of the two kinds inoculated with a trace of virulent blood gave cultures abundant enough of the microbes of hog cholera. But while in the liquid of the vaccinated, this microbe presented itself chiefly under the form of a chain composed of oval bacilli or cocci, the liquid of the witness rabbits contained only forms of mono-bacilli or diplo-bacilli. The difference in the growth of the cocco-bacilli in the two kinds of œdematous liquid is, consequently, very striking, while in the serum it is almost null.

Inoculated in the veins of the eye, or under the skin of rabbits, the cultures in the liquid of the œdema of the vaccinated appeared just as active as in those of control. The slight differences observed had no value, and are explained by the variations in weight and other individual characteristics of inoculated rabbits.

These experiments demonstrate that there is a very considerable difference between the influence of the liquid of the œdema and the complete serum of vaccinated rabbits. These prove, besides, that the variations in the form and growth of the bacteria (strepto-bacilli instead of diplo-bacilli) have no relation to the virulence.

The striking difference between the serum obtained out of the animal organism and the liquid of the œdema drawn directly from it, indicates to what point it would be imprudent to conclude, from the particularities of the serum, the phenomena to be due, which occur in the vaccinated organism. It is necessary, therefore, to study the properties of the latter.

This same postulate arises from the consideration that the preventive activity of the serum cannot be explained by the bactericide property, anti-toxic property, nor by the attenuative power of this humor. If the preventive serum does not act on the bacteria and its toxines, it is because it must exert its influence on the organism subjected to the treatment.

(To be continued.)

A RENAL CALCULUS OF UNUSUAL SIZE—NEPHRECTOMY—RECOVERY.

BY J. H. KELLOGG, M. D.

Superintendent Sanitarium, Battle Creek, Mich.

A PATIENT, Mrs. W., aged — years, was brought to me for examination, September —, by Dr. Darby, of Waterloo, Ind. She had suffered for a long time from pain in the right side, and some time previously the doctor had discovered a hard mass, which upon investigation proved to be an enlarged and prolapsed kidney. The mass was so large that it filled almost the entire right side, reaching from the lower ribs to considerably below the crest of the ilium, and extended inward nearly to the

median line. The patient suffered so much pain, and was evidently losing ground so rapidly, through the immense quantities of pus discharged with the urine daily, that I thought it best to advise the removal of the diseased organ, and after proper preparation of the patient, proceeded to operate.

My first intention was to operate by the abdominal method, on account of the great size of the mass, but at the last moment I concluded to undertake the operation by the lumbar method, fearing that some condition might be encountered which would render nephrectomy impossible or imprudent, so that the operation might be terminated as a nephrotomy, recalling a remark made by Mr. Lawson Tait, in conversation with the writer when a student assistant with him, in which the operation of nephrectomy was totally condemned, nephrotomy being considered by Mr. Tait the only justifiable operation upon the kidney. Mr. Tait's argument was, that any condition of the kidney likely to be benefited by an operation requires nothing more than nephrotomy, the cases in which nephrectomy would be of any service being in his opinion hopeless, even with a radical operation.

The operation was begun by a vertical incision reaching from the last rib to the crest of the ilium. When the kidney was reached, it was found to be closely adherent to its capsule, as the result of repeated inflammatory attacks which had also consolidated the fat lying outside of the capsule, making it even more difficult to separate the capsule from the adjacent tissues than to break up the adhesions between the kidney and the capsule. It was evident that a large opening would be required for the removal of the mass, and a transverse incision four inches in length, starting from the middle of the first incision, and running toward the linea alba, was accordingly made. This extension of the incision enabled me to introduce the whole hand, and by patient effort, the adhesion between the kidney and its capsule was finally completely broken up. It was, however, found impossible to extricate the enormous mass, although the opening was made as large as possible without entering the peritoneal cavity, by further extension of the transverse incision. I accordingly laid bare and amputated the anterior two thirds of the last rib, and by a considerable effort was then able to pull and push the kidney out of its bed. The central portion of the mass presented a stony hardness, which, taken together with a nodular appearance and feeling of the organ, suggested the probability of a malignant disease. The organ also presented several cyst-like masses, one of which was the size of a large orange.

After ligating the pedicle, excluding the ureter and inclosing the vessels in a separate ligature, I proceeded to amputate the mass, when I at once discovered, from the gritty sensation imparted to my knife, that the central hardness was due to an immense renal calculus which filled the whole interior of the organ. As soon as the pelvis and the kidney were laid open, a great quantity of mingled pus, mucus, and urine which had been dammed back by the calculus, producing the cystic condition before referred to, rushed out. Precaution had been taken to protect the wound, as far as possible, from infection from this source, and the tissues exposed were thoroughly disinfected; the operation was quickly terminated, two drainage tubes being introduced into the deeper parts of the wound, which was closed by deep sutures, which, when tied, obliterated almost entirely the cavity left by the removal of the kidney. The upper portion of the ureter, which was enormously dilated and thickened, was stitched to the skin. The ligatures were left long so as to facilitate removal, absolute aseptic management of the wound being evidently impossible. Considerable hemorrhage occurred during the operation, as the tissues lying about the kidney were exceedingly vascular. This was well controlled, however, by stuffing the wound from time to time with sterilized gauze and by application of sponges wet in hot water.

The calculus was found to weigh 137 grams, the largest of the kind removed during life of which I have found any record. A photo-reproduction of the calculus, natural size, is presented as the frontispiece of this number.

The patient made a rapid and excellent recovery. The temperature subsequent to the operation, did not at any time exceed 101.4°. Only the very slightest suppuration occurred, so that the tubes were removed in a few days. On the

tenth day all the sutures were removed. Within a few days subsequent to the operation, the condition of the patient was found to be decidedly better than before the operation. The pus, which before the operation had been so great in quantity as to render the urine very thick and its filtration very slow, had disappeared almost entirely. Before the operation, the quantity of urine passed in twenty-four hours was 850 c. c.; the specific gravity, 1018; urea, 18.7 grams; total solids, 30.6 grams. The pus was so great as apparently to constitute fully one half of the total amount of liquid; and boiling, after the addition of nitric acid, showed a quantity of albumen 1–32nd of the volume of the urine tested.

The toxicity of the urine, as determined by the method of Bouchard, which consists of an injection of the urine into the veins of a rabbit in quantities sufficient to produce death, was as follows: The amount required to kill a rabbit weighing 1.4 kilos, 40 c. c., making a urotoxie, or the amount required to kill one kilogram of rabbit, 28.6 c. c.; the total number of urotoxies produced in twenty-four hours, or the possible amount of living being killed by the urine of twenty-four hours, 29.7 kilos; the urotoxic coefficient, or possible amount of living being killed by the urine produced by each kilogram of patient in twenty-four hours, .6. The rabbit died in two minutes from the beginning of the injection, with slight spasm, the pupil being first contracted, then dilated; the temperature rose .4 of one degree C. In three days after the operation, the amount of urine was found to be 900 c. c. The reaction, formerly extremely alkaline, had become normally acid, 10 c. c. of the urine requiring 1.5 c. c. of the decinormal solution of sodium hydrate to neutralize it. The specific gravity was 1030; the urea, 48.6 grams; there was a bare trace of albumen, and only a few pus corpuscles to be found in each field. One half minute after the beginning of the injection, the rabbit's pupils began to contract, and a powerful tetanic spasm occurred, which continued until death, one minute after the injection began. The pupils were extremely contracted, and there was pronounced exophthalmus, but no change in temperature.

The toxicity was found to be as follows: Amount required to kill a rabbit, the weight of which was 1.8 kilos, 16 c.c.; urotoxie, 8.6; number of daily urotoxies, 104.6; the urotoxic coefficient, 2.113. The amount of urea produced by the one kidney subsequent to the operation was more than two and one half times that produced before the operation. The amount of total solids was more than double, and the toxicity was two and one half times as great, being nearly five times greater than normal, indicating an abnormal increase of toxic matters in the system subsequent to the operation, perhaps in part the result of absorption from the extensive wound, although sepsis in the wound was almost entirely absent.

October 2, three weeks after the operation, an examination of the urine gave the following results: Quantity for 24 hours, 1421 c.c.; specific gravity, 1016; urea, 21.3; total solids, 55.47 grams.

A very slight sediment, consisting of urates, phosphates, and oxulates; no pus; no albumen; reaction natural.

These observations are of interest, as showing the ability of a kidney to assume double duty at once, when called upon to do so, and even to do an amount of work considerably greater than that ordinarily performed by two sound kidneys. The patient's suffering the night following the operation, was so slight that considerable sleep was obtained. She has already recovered from the operation, and, with the exception of being somewhat weak from confinement in bed, is in every way in a better physical condition than before the operation was performed.

THE NEW CHEMISTRY OF THE STOMACH.

Illustrative Cases — A New Classification.[1]

BY J. H. KELLOGG, M. D.

Before presenting a series of cases illustrative of the different types and varieties of stomach disorders as relates to the disturbance of the normal chemical processes of digestion, it may be well to recall briefly the significance of the different quantities which furnish the basis of classification. Each of the quantities represented by the symbols (A), (A′), (*a*), (T), (H), and (C), teaches an

[1] The matter contained in this article was presented at the Cincinnati meeting in a paper by the author, entitled "Methods of Precision in the Investigation of the Disorders fo Digestion, or The New Chemistry of the Stomach."

important fact in relation to the work done by the stomach.

(A) represents the total acidity which is normally due almost wholly to free HCl and the combined chlorine or chloro-organic combinations present in the gastric juice, only a very small percentage of acidity being normally attributable to lactic acid and acid phosphates. In normal conditions, the total acidity is not less than .180 grams, nor more than .200 grams in 100 c. c. of stomach liquid, the acidity being represented as anhydrous HCl.

(A′). When the total acidity is greatly increased by the products of acid fermentation, it is important to know what portion of the acidity is due to normal elements, and how much must be attributed to lactic acid or to other members of the series of fatty acids. A′ is found by multiplying the quantity C by .86, the normal coefficient, and adding H; obtained from the formula $A' = (a \times C) + H$.

(a). This quantity, obtained from the formula $\frac{A-H}{C} = a$, has for its normal value, .86. A higher figure represents the presence of abnormal acids resulting from fermentation. A lower value shows the presence in the quantity C of neutral chloro-organic combinations having a resemblance to normal digestive products, but without nutritive value, and which contribute nothing to the acidity of the stomach fluid. Both of these facts are of great importance, and as the information conveyed by them can be obtained in no other way, the value of a as a means of determining the quality of the chemical work done by the stomach will be readily appreciated. When below the normal figure, it indicates with certainty that the value C is depreciated by neutral chloro-organic compounds; but the amount of this depreciation is not so clearly indicated by the lowered value of a as is the amount of acid fermentation by its increased value, since the neutral compounds in C may be, to a greater or less extent, neutralized by the products of acid fermentation. Thus, while we are able to say that acid fermentation is present whenever we find a above the normal figure, we cannot with equal certainty say that acid fermentation is not present when a is less than the normal figure.

This fact is clearly shown by one or two remarkable cases, the details of which will be given later in this paper, in which the value of a is ∞, being represented by a fraction with a whole number for a numerator, and zero for a denominator, $\left(\frac{x}{0}\right)$. Here x represents the amount of acidity due to the products of acid fermentation. It is evident that C might in a given case possess such a value, although wholly composed of neutral compounds, as to mask completely the value x, thus hiding the presence of the abnormal acids. The amount of acidity due to the products of fermentation which can be hidden in this way, is, however, comparatively so small that this fact does not materially lessen the value of a as an index to the quality of the chemical work done in the digestive process, and it may properly be regarded as the coefficient of digestive work. It should be remembered that a represents, not a definite quantity, but simply the proportion which exists on the one hand between the acidity normally due to the chloro-organic compounds, or C, and the increased acidity due to the presence of the products of the acid fermentation, or the diminished acidity due to the presence of neutral compounds in C. When a is found to be zero, as we have observed in a number of instances, the indication is positive both that acid fermentation is wholly absent, and that C is wholly composed of neutral and worthless compounds. a becomes ∞ when C is 0, and when A exceeds H, the result obtained by subtracting H from A in this case representing exactly the amount of acidity due to acid fermentation. The significance of a when found to be 0 or ∞, is readily shown by the following formulæ: —

Recalling the formula $A = H + C + x$, in which x represents the products of acid fermentation, and the formula derived from the foregoing $\frac{A-H}{C} = \frac{C}{C} + \frac{x}{C}$, it is clear that in any case in which $C = 0$, we shall have $\frac{A-H}{0} = \frac{x}{0}$, or ∞.

(T) represents the total chlorine, making allowance for the amount of chloride of sodium taken in the test-meal, and indicates the total amount of gland work done in the stomach in the secre-

tion of fixed chlorine, that is, chlorine combined with bases.

(H) represents the amount of chlorine which has been set free under the vital influence of the stomach work, and is ready to enter into the digestive process proper, by combining with albumen.

(C) represents the amount of chlorine which, after having been set free from the bases, has entered into combination with albumen, and thus has taken part in the digestive process. When C has its proper acid value, it represents the useful chemical work done by the stomach. The sum of H and C represents the total amount of chlorine set free from the bases, or what might be termed the preliminary chemical work done by the stomach.

In considering from a therapeutic point of view the results obtained by the chemical analysis of stomach fluids, it is necessary especially to keep in mind the four possible kinds of work done in the stomach : —

1. *Gland work*, represented by T.
2. *Preliminary* chemical work, represented by H + C.
3. *Useful chemical work*, represented by C taken in connection with *a*.
4. *Vicious chemical work*, or fermentation, indicated by the increased value of *a*.

Illustrative Cases.— Within the last six months, nearly 400 analyses of stomach fluids have been made under the writer's supervision in the Sanitarium Laboratory of Hygiene, the fluids analyzed having been obtained from nearly 300 different cases. The cases studied in this paper number 240, and the number of analyses 340. Careful study has been made of the results obtained by each analysis, together with a careful comparison with the symptoms presented by the patient. It is not intended to present in this article even a brief summary of all the interesting facts which have been noted, but merely to give a sufficient number of cases to illustrate each one of the leading forms of disturbance in the digestive process, which have been observed.

Before presenting these illustrative cases, it must be stated that the study of this large number of cases has brought to light a considerable number of forms which were not noted by Hayem and Winter in their investigation, which involved only 200 analyses, and a considerably smaller number of cases. As the work progressed, the increasing number of new forms finally became so great as to compel me to undertake a new classification. The necessity for a new classification has been more and more impressed upon the mind of the writer, in noting the marked difference as regards therapeutic requirements existing between cases grouped by Hayem and Winter, in the same class. The classification herewith presented is certainly not above criticism, and whether or not it is any improvement upon classifications previously presented, will appear only after it has been subjected to the ordeal of criticism by those competent to estimate its value, and the test of a longer experience. It is offered simply as the best attempt the writer can make at the present time toward grouping the various forms of disturbance in the chemical processes of the stomach in such a manner as to show at a glance both the therapeutic indications and the relation of each individual form to dissimilar or cognate forms.

The classification offered ought not perhaps to be termed a new one, as it is in fact only a re-arrangement and an extension of that made by Hayem and Winter.

The term *hyperpepsia* is used to indicate an excess of stomach work; *hypopepsia*, a deficiency of stomach work; *hyperhydrochlorie*, an excess of free HCl; *hypohydrochlorie*, a deficiency of free HCl. The terms *hyperacidity* and *hypoacidity* are self-explanatory. The principles upon which the classification is based are as follows : —

Three great classes are recognized,—

I. *Hyperpepsia*, in which an excessive amount of both glandular work and chemical work are done.

II. *Hypopepsia*, in which there is a notable diminution in the stomach work; if not always in the glandular work, in the chemical work.

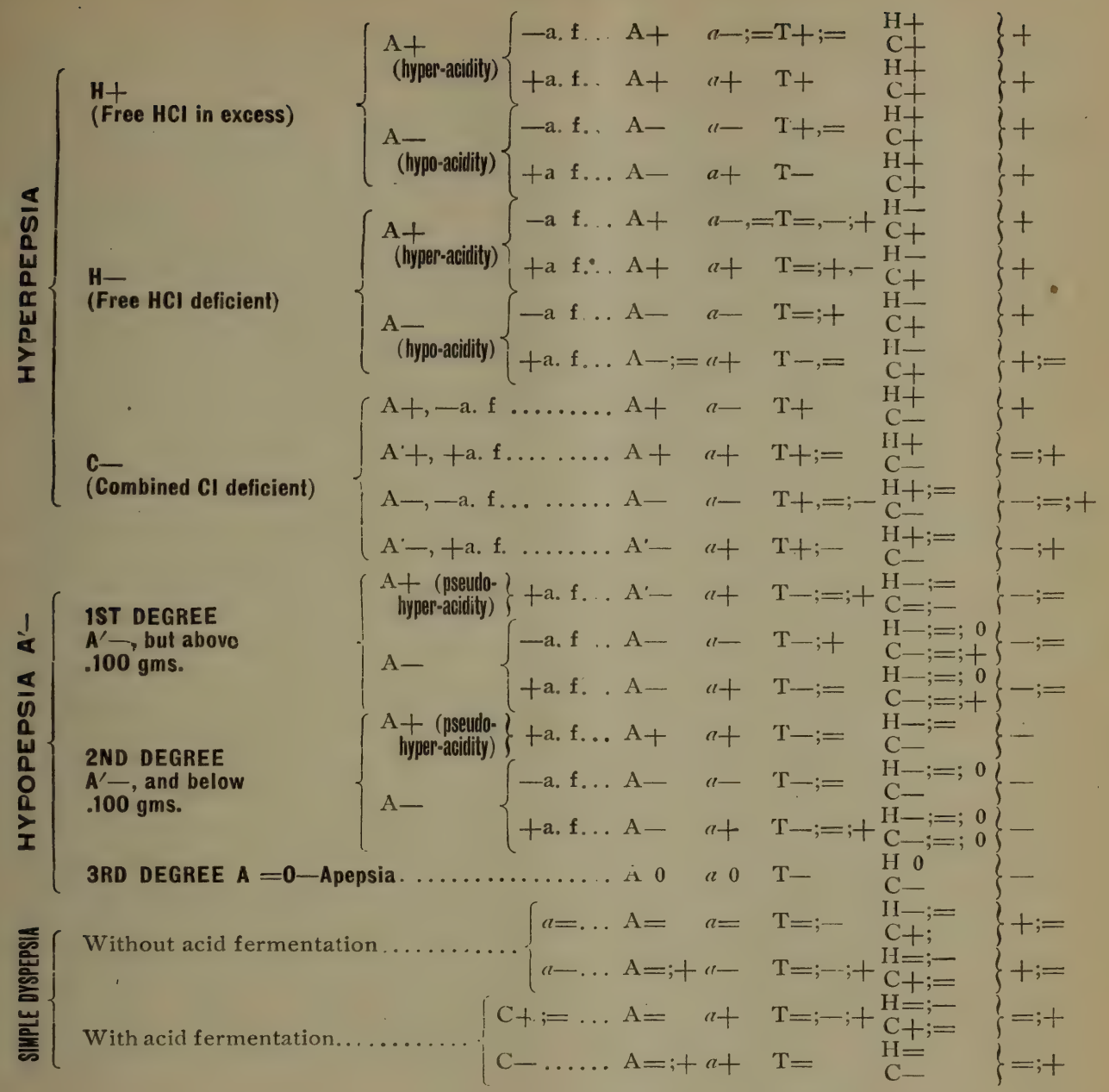
III. *Simple dyspepsia.*

Each of these classes is again subdivided.

Hyperpepsia is divided into three groups, the characteristics of which are,—

(a.) H +, free hydrochloric acid in excess. Hyperpepsia with hyperhydrochlorie.

(b.) H —, free hydrochloric acid deficient. Hyperpepsia with hypohydrochlorie.



(c.) C —, a deficiency of useful chemical work.

We always find C + in groups (a) and (b), and H + in group (c).

Groups (a), (b), and (c) are each divided into sub-groups, in which we find, respectively, A +, and A —, or hyperacidity and hypoacidity.

We have a still further division of each sub-group into two types, as acid fermentation is present or absent, as indicated by coefficient *a*.

In group (c), characterized by C —, the sub-groups A + and A — combine with the two types into which they are respectively divided, and present each a secondary variety, A'+ and A'—, making four groups each with one type, acid fermentations occurring with both A'+ and A—, while A+ and A'— occur only in cases without fermentation.

Hypopepsia.— The basis chosen by Hayem and Winter for the classification of hypopepsia is followed, three classes being formed, in the first of which A' is less than normal but above .100, and in the second, below .100; in the third, or apepsia, A' is 0. A' is necessarily always —, in hypopepsia. In each of the first and second degrees of hypopepsia, we have two sub-groups, A— and A+, or hypoacidity and hyperacidity. A — presents two types, as acid fermentation is absent or present. A+ presents, necessarily, but one type, that of acid fermentation. This type is conveniently termed *pseudo-hyperacidity*, as the total acidity may be high, although the value of *a* due to the normal elements of gastric juice, or A', may be small.

Simple Dyspepsia.— I have divided simple dyspepsia into two classes : —

(a.) Cases in which acid fermentation is absent.

(b.) Cases in which acid fermentation is present.

Each of these groups is divided into sub-groups. The basis taken for the subdivision of group (a) is the value of co-efficient (*a*), which may be (1) =, or (2)—. In group (b) the basis of subdivision is the value of C, which is (1) = or +, and (2) —.

The utility of this classification from a therapeutical standpoint will be seen when we consider the therapeutic indications of each of the several classes, sub-classes, and types recognized in this class of cases. How these therapeutic indications are to be met is a subject too large for consideration in this paper, but one which I have made the subject of long and varied experimentation, extending through many years, the results of which I shall report in another paper. The limits of this paper will admit of no more extended reference to this branch of the subject than the following brief suggestions: —

In the accompanying outline exhibiting the classification which I have briefly described,— a.f. means without acid fermentation ; + a.f., with acid fermentation.

For convenience of reference, I reproduce here, the table of normal variations given in the preceding article : —

Total acidity (A).....(0.180—.200 gms)
Coefficient (a).....(.86)
Total chlorine (T)...(0.300—0.340 gms.)
Free HCl (H).....(0.025—0.050 gms) } .180–.225
Organic chlorides(C)(0.155—0.180 gms) }
Fixed chlorides (F).....(0.109 gms.)
Normal Digestion.....(0.109 gms.)

CASE 64.

Normal Digestion.— A lady aged 35 years had been for a few weeks under treatment for pelvic and nervous disorders, which required an application of the rest-cure. She had been recently allowed to take exercise, and was gaining rapidly in flesh and strength ; tongue clean, and no symptoms of disordered digestion. The following were the quantities found: (A), .175 ; (*a*), .85 ; (T), .322 ; (H), .042 ; (C), .156 ; giving the formula, $A = a = T = \begin{matrix} H = \\ C = \end{matrix} \} =$.

In this case, the chemical processes concerned in digestion are evidently entirely normal.

Hyperpepsia. — The following case illustrate the different forms of hyperpepsia : —

Hyperpepsia with hyperhydrochlorie and hyperacidity — without acid fermentation.

CASE 39.

The patient, a lady aged 49 years, had suffered for many years from disorders which had been greatly aggravated by the frequent use of purgatives for the relief of obstinate constipation. The symptoms relating to the stomach were, eructations of gas, extreme acidity, frequent attacks of severe pain in the stomach, good appetite, heaviness at the stomach. Many neurasthenic symptoms were also present, including great mental depression, sleeplessness and vertigo, urine scanty, with sediment of urates and uric acid. Physical examination showed the stomach to be moderately dilated, great tenderness in both lumbar ganglia of the sympathetic, abdominal muscles very tense. The quantities given by analysis were as follows: (A), .256 ; (*a*), .07 ; (T), .560 ; (H), .240 ; (C), .224.

Formula, $A + a - T + C + \begin{matrix} H + \\ \end{matrix} \} +$.

Hyperpepsia due to a great excess of free hydrochloric acid, but without acid fermentation. The eructations of gas and other symptoms in this case would have led to the conclusion that the patient was suffering from simple acid dyspepsia, and might perhaps have suggested the employment of hydrochloric acid as a means of suppressing abnormal fermentations, or remedies of a stimulating character to induce a greater degree of digestive activity. The gas was evidently the result, not of fermentation, but of the secretion of CO_2 from the blood, which not uncommonly occurs in cases of excessive irritability and consequent congestion of the gastric mucous membrane. On the employment of means for suppressing the excessive amount of glandular activity shown by the high figure of (T), the patient rapidly improved, and in a few weeks left the Sanitarium with every evidence of permanent improvement of health.

Hyperpepsia with hyperhydrochlorie and hyperacidity — acid fermentation.

CASE 226.

A young man aged 22 years, who had been addicted to hasty eating, overeat-

ing, excessive use of sweets, confectionary, meats, drinking freely of fluids at meals, and of sedentary habits, had employed for relief, but without benefit, various mineral acids, hot water drinking, etc. He complained constantly of too abundant secretions in the mouth, burning in the œsophagus, fullness, distension of the stomach, eructations of great quantities of gas, regurgitation of hot, sour liquid, frequent attacks of sharp pain in the stomach soon after eating, excessive appetite, inability to digest coarse foods, such as cabbage, green peas, etc.; burning and heaviness at the stomach; extreme constipation, bowels moving not more often than once in three days; stools hard; gaseous distension of the bowels; poor memory; inability to concentrate the mind; dullness; hesitancy in speaking; drowsiness after meals; headache; heaviness in the head; strained feeling in the eyes; pain in the scalp and chest; coldness of extremities, especially of the knees; feverishness fifteen or twenty minutes after eating; specks before the eyes; occasional loss of sight; general feeling of weariness and exhaustion; shortness of breath. Physical examination showed a considerable degree of dilatation of the stomach. The quantity of stomach fluid removed was 125 c. c., reddish in color, and presented a considerable quantity of mucus. The quantities obtained were as follows: (A), .352; (*a*), .95; (T), .428; (H), .140; (C), .224.

Congo-red and methyl-violet gave strong reactions. Uffelmann's reagent showed lactic acid present in considerable amount. Biuret reaction showed peptones present in moderate amount. Lugol's solution gave blue violet color, indicating but slight digestion of starch. The chemical work done by the stomach in this case is represented by the following formula:

$$A + a + T + C + \left.\begin{matrix} H + \end{matrix}\right\} +.$$

CASE 73.

A young woman of twenty-four years, had suffered for many years from stomach disorders, without finding relief, although a great variety of medical means were employed. The following quantities were obtained: (A,) .380; (*a*), 1.35; (T), .440; (H), .070; (C), .230.

Formula, $A + a + T + \left.\begin{matrix} H \\ C + \end{matrix}\right\} +.$

Uffelmann's reagent showed in this case a great amount of lactic acid, and the stomach fluid when withdrawn exhibited a dark brown color, probably due to the presence of a small quantity of blood, the result of the intense congestion of the mucous membrane present in the case. The hyperacidity in this case was certainly very remarkable, and the highest I have yet encountered, being nearly double the maximum amount presented in health. The determination of the value of (A′) in this case, shows that the acidity due to the products of acid fermentation was equivalent to nearly .100 grams of anhydrous HCl for each 100 c.c. of the stomach fluid.

Hyperpepsia with hyperhydrochlorie and hypoacidity — without acid fermentation.

CASE 51.

The patient, a lady aged 37 years, had suffered for many years from a variety of stomach symptoms, which had recently led to a diagnosis of malignant disease. She had been assured that she was suffering from cancer involving stomach, liver, and spleen, and that her case was hopeless. The patient suffered from constant pain in the stomach, flatulency, throbbing at the epigastrium, pain in the head, general nervousness, depression, emaciation, and obstinate constipation. Physical examination showed extreme sensitiveness of the solar plexus and of both lumbar ganglia; the lower border of the stomach was three inches below the umbilicus, the right kidney was prolapsed, the bowels prolapsed, the abdominal walls extremely flaccid. The figures furnished by analysis of the stomach fluid were as follows: (A), .132; (*a*), .38; (T), .364; (H), .048; (C), .224.

Congo-red and methyl-violet both gave good reactions, and the biuret reaction indicated the absence of albuminoids. The formula representing the digestive work in this case is $A - a - T + C + \left.\begin{matrix} H = \end{matrix}\right\} +$

The figures for (H) are so near the maximum in this case, that it is evidently proper to class it with cases in which (H) is +, the case being, in all other respects, identical with those which fall in this group.

Hyperpepsia with hyperhydrochlorie and hypoacidity — with acid fermentation.

CASE 207.

The formula for a typical case of this form of dyspepsia would be, $A - a + T + \begin{matrix} H + \\ C + \end{matrix} \Big\} +$. I have not yet met a typical case of this form, but have found cases so nearly approaching it that I expect to meet it in the study of a larger number of cases. It is only necessary that the value of C should be so small that with the addition of the products of acid fermentation present in the case, the total acidity is still below the normal figure, a condition which is certainly not unlikely to occur.

Hyperpepsia with hypohydrochlorie and hyperacidity — without acid fermentation.

CASE 197.

A lady, aged 30 years, had long suffered from severe headache, although she had experienced no special symptoms which she had herself attributed to the stomach. She herself confessed to careless habits of eating, eating hastily and sometimes to excess, especially in the use of flesh meats and salads, of which she was very fond. The patient was also subject to attacks of shortness of breath and impairment of vision. Physical examination showed foul tongue, great tenderness of both the right and the left ganglia and of the abdominal sympathetic. Examination of the stomach fluid gave the following results: (A), .204; (*a*), .76; (T), .332; (H), .000; (C), .268.

Congo-red gave a good reaction; methyl-violet, none. Uffelmann's reagent showed lactic acid present, and the biuret reaction indicated the presence of peptones in moderate amount. The above figures furnish the following formula: $A + a - T = C + \begin{matrix} Ho \\ \end{matrix} \Big\} +$. In this case it will be noted that peptones were formed, notwithstanding no free hydrochloric acid whatever was present in the gastric juice. An abundance of hydrochloric acid was secreted, as shown by the high figure of (T), and more than the usual amount of useful stomach work was done, as shown by the high figure of (C). The diminished value of coefficient (*a*), however, indicates the presence of an abnormally large amount of neutral compounds in (C), probably a larger amount even than is indicated by the lessened value of coefficient (*a*), since lactic acid was shown to be present, indicating a considerable degree of acid fermentation concealed. When (C) is in excess, its quality is usually diminished, a very striking example of which we have already given in case 39, in which the value of coefficient (*a*) was only .07.

CASE 246.

The patient, aged 43 years, had suffered for many years from stomach disorders as the result of hasty eating, overeating, irregular meals, excessive use of sweets, fats, meats, fluids at meals, pickles, vinegar, and tea and coffee. Bad positions in sitting, sedentary habits, and the traction of heavy skirts upon tight waistbands had aggravated her disorders. Quinine, mineral waters, and various other measures and tonics had been tried without relief. The patient observed a metallic taste in the mouth in the morning; which would sometimes remain during the entire day; a very bad breath; eructations of gas; fullness in the stomach; nausea, lasting from 15 to 20 minutes; appetite variable; special craving for coffee, pastry, and rich food; bowels constipated; prolapse of rectum; extremely nervous and depressed; occasionally giddy; constant sense of weariness; palpitation of the heart. Physical examination showed a brown coat upon the tongue, and extreme tenderness of the sub-umbilical ganglion. Examination of the stomach fluid after the usual test-meal consisting of 1½ ounces of water crackers with 8 ounces of water, gave the following figures: (A), .200; (*a*), .71; (T), .376; (H), .008; (C), .272.

Congo-red and methyl-violet both gave good reactions. Reaction for lactic acid was pronounced, as also the biuret reaction. Lugol's test showed that starch digestion had advanced only to the state of erythro-dextrine, as indicated by the light purple color; rennet ferment abundant. The above figures give the following formula: $A = a - T + \begin{matrix} H - \\ C + \end{matrix} \Big\} +$.

The acidity in this case is at the extreme upper limit of normal variation, and hence the case may be fairly classed as one of hyperpepsia with hypohydrochlorie and acid fermentation, without acid fermentation. The following is another very interesting case of the same sort: —

CASE 236.

The patient, aged 45 years, had not considered herself dyspeptic, and until recently had enjoyed excellent health. Weighed, eighteen months previously, 192 pounds; present weight, 108 pounds; had been accustomed to use meat, sweets, and coarse vegetables freely, but made little use of fruits; condiments, tea, and coffee had also been freely used. The only symptoms relating directly to the stomach, which the patient had noted, were, occasional vomiting when constipated, and burning at the stomach much of the time; frequent attacks of diarrhœa; pain in the right side; ringing in the ears; scanty urine. Physical examination showed stomach and bowels prolapsed, right and left ganglia of the sympathetic sensitive, abdominal walls extremely flaccid. Examination of the stomach fluid gave the following figures: (A), .196; (*a*), .80; (T), .324; (H), 004; (C), .240.

Methyl-violet gave a slight reaction for free HCl. Uffelmann's reagent indicated the presence of lactic acid. Biuret reaction showed abundance of peptones; Lugol's solution showed imperfect digestion of starch. The formula furnished by the above figures, is $A=a—T=C+\left\{\begin{matrix}H—\\ \end{matrix}\right\}+$. A case of hyperpepsia with hypoacidity and a deficient amount of free hydrochloric acid, or hypohydrochlorie, but without acid fermentations.

Many cases of this sort are met, and show clearly that the presence of free HCl is not a matter of so great importance as has formerly been supposed. The diminished value of (*a*) in this case, accounts in part, perhaps, for the steady loss of flesh observed in this patient during a series of months. The patient made a rapid gain in flesh after being put to bed and subjected to the treatment indicated for relief of her stomach disorder.

Hyperpepsia with hypohydrochlorie and hyperacidity — acid fermentation.

CASE 254.

The patient, a young woman aged 22 years, had for two or three years been running down in health, suffering from a variety of nervous symptoms which had been attributed to excessive work in school, and other causes which probably had little or nothing to do with her condition. The patient was considerably emaciated, very weak, and extremely nervous. Physical examination showed a foul tongue; stomach dilated, the lower border of the stomach being an inch below the umbilicus; the abdominal walls much relaxed; considerable degree of ovarian irritability, which, however, probably had little to do with the general condition. The amount of fluid withdrawn from the stomach was 60 c. c., and examination gave the following results: (A), .280; (*a*), 1.03; (T), .312; (H), .004; (C), .268.

The color reagents showed the presence of free hydrochloric acid in abundance, also lactic acid. The biuret reaction showed peptones abundant. Lugol's solution gave a purple reaction, indicating imperfect starch digestion. Rennet ferment abundant. The formula resulting from the above is as follows: $A+a+T=\left\{\begin{matrix}H—\\ C+\end{matrix}\right\}+$.

The young woman made rapid improvement under measures directed to the relief of her stomach disorder.

Hyperpepsia with hypohydrochlorie and hypoacidity — without acid fermentation.

CASE 151.

The patient, a lady aged 45, had long suffered from digestive disturbance as the result of irregular eating, the use of pickles, cheese, and other harmful articles of food, waist constriction from corsets and waist bands, and the use of coffee. Appetite diminished, stools very irregular, alternation of constipation and diarrhœa, gaseous distension of the bowels, tenesmus of lower bowel, general nervous exhaustion, constricted feeling in the region of the heart, tongue flabby, hyperæsthesia of the lumbar ganglia of the sympathetic. At the time of examination there was impaction of the lower bowel. The amount of fluid was 74 c. c. A .160, *a* .73, T .304, H .008, C .206. Congo-red and methyl-violet both gave slight reaction. Lactic acid test negative, peptones abundant. Formula: $A—a—T=C+\left\{\begin{matrix}H—\\ \end{matrix}\right\}+$.

Hyperpepsia with hypohydrochlorie and hypoacidity — with acid fermentation.

To complete the scheme of classification, I ought to be able to present here a case of hyperpepsia with hypohydro-

chlorie and hypoacidity — with acid fermentation. Such a case would require the following formula: A—*a*+T+;=;—$\begin{matrix}H-\\C+\end{matrix}\}$+;=. As will be seen by reference to the chart, this formula might occur also in hypopepsia of the first degree, with hypoacidity and acid fermentation, the only thing required being a slightly higher value for T and for C than I have happened to meet in any of the cases thus far studied; so this may be considered as the point at which hyperpepsia and hypopepsia meet and overlap.

Hyperpepsia with deficient combined chlorine (C—) *and hyperacidity — without acid fermentation* (A+).

CASE 129.

A young woman aged 22 years, had been accustomed to take large quantities of fluids at meals, and had taken large quantities of iron, which she thought to be in part the cause of her condition; suffered from regurgitations of food, especially at menstrual periods; had excessive appetite and a craving for acid foods; extremely nervous; impaired memory; loss of energy; mental confusion; inability to concentrate the mind; occipital and frontal headache; general pain; distress and giddiness; disturbance of vision; specks before the eyes; appearance of fire before the eyes; general exhaustion; trembling of the limbs. Physical examination showed tongue coated white over its whole surface; the lower border of the stomach one inch below the umbilicus; solar plexus extremely sensitive; abdominal walls flaccid. The amount of stomach fluid withdrawn was 170 c.c., more than four times the normal amount. The following is the result of the examination of the stomach fluid: (A), .256; (*a*), .80; (T), .360; (H), .152; (C), .130.

Peptones abundant. Formula, A + a —T + C—$\begin{matrix}H+\\ \end{matrix}\}$+. A case of hyperpepsia with diminished amount of useful chemical work, as shown by C —, and hyperacidity from the excessive quantity of hydrochloric acid present, but without acid fermentation.

Hyperpepsia with deficient combined chlorine (C—) *and hyperacidity* (A'+) — *with acid fermentation.*

CASE 199.

Young woman of 28 years, who had suffered from stomach disorders for a number of years, the most prominent symptoms being acid and flatulent dyspepsia; heaviness of the stomach; general weariness and confusion of thought. Quantity of fluid withdrawn, 150 c. c. Result of examination of stomach fluid: (A), .280; A', .252; (*a*), 1.14; (T), (H), .394; .166; (C), .100.

Formula derived from the above quantities: A + *a* + T + C—$\begin{matrix}H+\\ \end{matrix}\}$+.

This case is nearly identical with the preceding, only differing from the fact that acid fermentation was present.

It is important to obtain the value of A' in these cases, so as to be able to form a correct judgment respecting the amount of actual stomach work done, as the value of A in cases of acid fermentation is always more or less attributable to the acid products of fermentation. By comparison of the values A' and A, one can form at once an estimate of the amount of normal chemical work done by the stomach as compared with the abnormal chemical work in the form of acid fermentation.

Hyperpepsia with deficient combined chlorine (C—) *and hypoacidity — without acid fermentation.*

CASE 59

A man of 57 years, who had for many years been accustomed to high living and the free use of ardent spirits. Examination of the stomach showed marked dilatation. A chemical analysis gave the following figures: (A), .088; (*a*), 0; (T), .360; (H), .090; (C), .090.

Biuret reaction very slight, neither indicating the absence of peptones nor of albuminoids. Formula, A — *a* — T + $\begin{matrix}H+\\C-\end{matrix}\}$=. A case of marked hyperpepsia, as indicated by the high figure for free hydrochloric acid, yet with pronounced hypoacidity, and without acid fermentation. The zero value of coefficient (*a*) indicates the total absence of useful work on the part of the stomach.

Hyperpepsia with deficient combined chlorine (C—) *and hypoacidity* (A'—) — *with acid fermentation.*

CASE 155.

The patient, aged 25 years. The stomach fluid when withdrawn was green in

color, indicating the presence of bile. Result of analysis: (A), .192; (A'), .152; (*a*), 2.29; (T), .404; (H), .128; (C), .028.

Formula derived from the above quantities, $A' - a + T + C - \left\{ \begin{matrix} H + \\ \end{matrix} \right\} -$. A case of hyperpepsia with hypoacidity, and with deficiency of useful stomach work, and acid fermentation.

In this, as in the analogous case — 199 — it is necessary to obtain the value of A' in order to form a correct estimate of the amount of normal chemical work done by the stomach, since the acid fermentation present contributes more or less to the value of A. In the present case, A is normal, although A' is much below the normal value, and this notwithstanding the high value of H.

Hypoacidity of the first degree (A'— but above .100) with pseudo-hyperacidity (A' +) due to acid fermentation.

CASE 154.

The patient, aged 37 years, had suffered from stomach disorders for some time; had been addicted to the free use of tea and coffee and usual errors in diet. The stomach symptoms noted, were, distress two or three hours after eating; eructations of gas; sometimes regurgitation of food with small clots of blood; vomited black clots of blood one month previous; burning pain; appetite variable; bowels very inactive; insomnia; general exhaustion; palpitation of the heart. Physical examination showed red tongue coated in the center; lower border of stomach below the umbilicus; great tenderness of the solar plexus and the umbilical ganglia; general tenderness of the abdomen. Stomach tube withdrew 120 c. c. of fluid. Analysis gave the following figures: (A), .320; (A'), .140; (*a*). 2.14; (T), .392; (H), .020; (C), .140.

Peptone reaction slight. Formula, $A + (A^1 -) a + T + C - \left\{ \begin{matrix} H - \\ \end{matrix} \right\} -$.

Hypopepsia of the first degree with hypoacidity — without acid fermentation.

CASE 275.

A young woman, 25 years of age, had suffered from dyspepsia and a variety of general nervous and pelvic symptoms for a number of years. Stomach tube withdrew 70 c.c. of fluid. Result of examination: (A), .124; (*a*), .73; (T), .288; (H), .016; (C), .148.

Peptones and rennet ferment abundant. Lugol's solution gave purple reaction for erythro-dextrine. Formula, $A - a - T - C - \left\{ \begin{matrix} H - \\ \end{matrix} \right\} -$. A case of hypopepsia of the first degree, with hypoacidity and without acid fermentation.

Hypopepsia of the first degree with hypoacidity — with acid fermentation.

CASE 117.

The patient, an unmarried lady aged 33, had suffered for a number of years with stomach disorder, the prominent symptoms of which were nausea in the morning, constipation, constant occipital headache, sensation of pressure and heaviness in the head, and muscular twitching. The lower border of the stomach was two inches below the umbilicus. The right kidney was movable, hyperæsthesia of the right lumbar ganglion of the sympathetic. The quantities obtain by analysis were as follows: Amount of stomach fluid 300 c. c.; slight amount of mucus present. A .140, *a* .89, T .202, H O, C .158. The formula: $A - a + T - C = \left\{ \begin{matrix} H\,O \\ \end{matrix} \right\} -$.

Hypopepsia of the second degree (A' — and below .100) — with pseudo-hyperacidity (A —).

CASE 61.

The patient, a lady aged 29, had suffered for many years from indigestion, the result of irregular meals, the free use of sweet pickles and other indigestible articles of food, waist constriction by corset wearing and tight waist bands, and the continuous use of purgatives. Had also taken chloride of gold and strychnia.

The prominent symptoms were choking, sensation of soreness in the œsophagus, fullness in the stomach, eructations of gas, nausea almost continuous, brief sensation of hunger a few hours after eating constipation, hemorrhoids, gaseous distension of the bowels, many neurasthenic symptoms, especially distress of mind and insomnia, occipital headaches, burning and pressure in head, giddiness, vertigo, sensations of chilliness, trembling, especially of the legs, muscular twitching, and palpitation of the heart. The phys-

ical examination showed the stomach to be dilated, the lower border being 1½ inches below the umbilicus. Analysis of the stomach fluid showed the following quantities: A .248, A′ .087, *a* 2.72, T .190, H .014, C .086. Congo-red and methyl-violet both gave good reactions. Peptones abundant. Formula: $A-a+T-\left.\begin{matrix}H-\\ \\ C-\end{matrix}\right\}-$. A very marked case of hypopepsia of the second degree, with pseudo-hyperacidity.

Hypopepsia of the second degree with hypoacidity — without acid fermentation.

CASE 265.

The patient, a woman aged 48 years, had suffered from digestive troubles for many years; had been addicted to hasty eating and over-eating, and to the excessive use of sweets, fats, and fluids, especially at meals, overwork at sewing late at night. Symptoms: bitter taste in the mouth in the morning, tender surface upon the tongue, scanty secretion in the mouth, eructations of gas, regurgitations of fluid frequently after eating, occasional vomiting of bile and mucus without nausea, sometimes vomiting the entire amount eaten; the vomited matter bitter; cramps in the stomach; faintness; faint sensation in the stomach; good appetite; the patient has observed that vegetables, fermented bread, and strong acids disagree with her; bowels very inactive; stools whitish, mixed with opaque mucus, at times bloody and large in amount; pain at and after stools; frequent ineffectual effort to relieve bowels; gaseous distension of bowels, with odorless flatus; drowsiness after meals, also at other times; heaviness in the head, bowels, and knees; pain in back and lower part of the shoulders, also in ribs and right side; sciatica, giddiness, vertigo; noise in the head, dreams of falling, coldness between the shoulders, also of the extremities; specks before the eyes; appearance of fire; twitching of the muscles.

Physical examination showed moderate dilatation of the stomach, and prolapse of the bowels. Amount of fluid withdrawn from the stomach, 100 c. c. Result of examination of stomach fluid: (A), .012; (*a*), 0; (T), .156; (H), .012; (C), .028.

Peptone slight. Lugol's solution gave no reaction, showing complete digestion of starch. Rennet ferment absent.

Formula, $A-a-T-C-\left.\begin{matrix}H-\end{matrix}\right\}-$. A case of hypopepsia of the second degree, without acid fermentation.

Hyperpepsia of the second degree with hypoacidity — with acid fermentation.

CASE 13.

The patient, a physician aged 35 years, had recently suffered from an attack of *la grippe* which had left him with greatly disordered digestion. Physical examination showed marked dilatation of the stomach. Stomach tube withdrew, after the test-breakfast, 55 c. c. Analysis gave the following figures: (A), .010; (A′), .0017; (*a*), 5.00; (T), .100; (H), .000; (C), .002.

Formula, $A-a+T-C-\left.\begin{matrix}H\ O\end{matrix}\right\}-$. A most pronounced case of hypopepsia of the second degree without acid fermentation, but was exceeded in another case, the details of which will be given at another time.

CASE 62.

A lady, aged 65 years, had suffered for years from frequent attacks of great pain in the stomach, which occurred at such short intervals that the pain was nearly continuous, the pain burning in character; also suffering from pain in the region of the liver and in the left side and from morbid taste. The stomach fluid contained a considerable amount of mucus. The following quantities were obtained by analysis: A, .175; A′, .096; *a*, 2.11; T, .260; H, .040; C, .064. Formula: $A'-(A-)\,a+T-C-\left.\begin{matrix}H=\end{matrix}\right\}-$.

In this case the free HCl (H) is normal in amount, but the case is nevertheless one of hypopepsia of a very pronounced type. Such cases are rare, but do exist, and emphasize the importance of a method of investigation which gives exact rather than presumptive data.

Hypopepsia of the Third Degree—Apepsia.— I have observed two cases of this sort, the most typical one of the two being herewith presented.

The analysis of the patient's stomach fluid easily explained the anæmic and emaciated condition which existed, and

the extreme exhaustion which had baffled all attempts to afford relief by the aid of tonics or other palliative measures.

Simple Dyspepsia.—The following cases, which for lack of space we will present as briefly as possible, represent the four forms of simple dyspepsia which are recognized in our classification.

Under appropriate treatment the patients showed marked improvement in nutrition.

CASE 247.

A young lady, aged 23 years. Amount of stomach fluid, 175 c. c. (A), .228 ; (*a*), .85 ; (T), .312 ; (H), .032 ; (C), .232.

Peptones abundant ; starch digestion moderate ; rennet zymogen abundant. Formula, $A + a = T = C + \left\{ \begin{matrix} H = \\ \end{matrix} \right.$. The deviation from the normal chemism of the stomach is not sufficient in this case to relegate it to any of the classes of morbid digestion. It is simple dyspepsia without acid fermentation. The high value of (*a*) which is practically normal, indicates the good quality of the chloro-organic compounds represented by (C). There was moderate dilatation of the stomach as shown by examination, as well as by the large quantity of liquid present at the end of the hour, which does not exceed, in healthy stomachs, 40 c.c.

CASE 119.

A man aged 26 years. Amount of stomach fluid withdrawn, 135 c. c. (A), .140 ; (*a*), .57 ; (T), .302 ; (H), .032 ; (C), .190.

Peptones abundant. Formula, $A - a - T = C + \left\{ \begin{matrix} H = \\ \end{matrix} \right. +$. The small value of (*a*) in this case indicates the depreciated value of (C), due to the presence of a large quantity of neutral chloro-organic compounds, which also diminished the total acidity. The value of (C), if wholly made up of normal elements, would produce with (H) an acidity represented by (A'), .195.

CASE 116.

A lady aged 24 years had spent a number of years in boarding-school, suffering from severe constipation of the bowels, hemorrhoids, inability to concentrate the mind, and extreme nervous irritability, with giddiness, sudden loss of strength, and general exhaustion, with general muscular weakness and debility. Her condition had usually been attributed to overwork in school. The patient had not considered herself a dyspeptic, but the physical examination showed a badly coated tongue and a relaxed condition of the abdominal muscles, the right kidney was movable and sensitive. By means of the stomach tube, 113 c.c. of fluid was withdrawn after the usual test-breakfast, an examination of which furnished the following data : (A), .200 ; (*a*), .88 ; (T), .286 ; (H), .002 ; (C), .224.

Lactic acid was present, and the biuret reaction showed a considerable amount of peptone. The following formula represents the chemical work of the stomach in this case : $A = a + T - C + \left\{ \begin{matrix} H - \\ \end{matrix} \right. +$. A case of simple dyspepsia without hyperacidity ; and deficiency of hydrochloric acid and slight acid fermentation.

CASE 89.

The patient aged 42 years. Amount of stomach fluid, 165 c.c. (A), .200 ; (*a*) .89 ; (T), .284 ; (H), .020 ; (C), .202.

Formula, $A = a + T - C + \left\{ \begin{matrix} H - \\ \end{matrix} \right. +$. In this case also the amount of disturbance of the stomach process is so slight that it may be classed as a simple dyspepsia with acid fermentation, probably due to the delay of the stomach in emptying itself of its contents.

CASE 94.

A man, aged 55 years. Amount of stomach fluids 110 c. c. (A), .168 ; (*a*), .87 ; (T), .310 ; (H), .050 ; (C), .136.

Uffelmann's reagent showed lactic acid present. Peptones abundant. Formula, $A - a + T = C - \left\{ \begin{matrix} H = \\ \end{matrix} \right. =$. A case of simple dyspepsia with C —, and acid fermentation. The diminished amount of useful stomach work through the failure of chlorine to combine with albumen, and the acid fermentation which may have been greater than that shown in the value of (*a*) as indicated by the amount of lactic acid present, were doubtless the result of the dilated condition of the stomach which prevented the complete and prompt emptying of the organ, and so gave rise to a slight degree of disturbance of the normal chemical process of digestion, and occasioned the setting up of a vicious chemical process in the form of acid fermentation.

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE LIVER AS A BILE-MAKING ORGAN.

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THERAPEUTIC CONSIDERATIONS.

I SHALL not undertake to deal with all the numerous problems which arise in relation to the therapeutics of the biliary passages. I shall deal with only three important points relating to this subject.

1. The treatment of biliary calculi.
2. New considerations in relation to icterus, and particularly infectious icterus.
3. Urticaria of hepatic origin.

The question of the treatment of biliary calculi was the subject of several very interesting and important communications made to the Congress held at Wiesbaden, in April, 1891. We have introduced into the therapeutics of this disease a new medicament, olive oil; and surgery, the methods of which have recently been perfected, undertakes to deal more successfully with this affection.

In his remarkable report to the Congress of German physicians, Naunyn, of Strasburg, has shown upon what a fragile basis repose all the chemical theories which have been invoked for the explanation of the precipitation of cholesterin in the bile. It has been claimed that if cholesterin, which constitutes the basis of biliary calculi, is precipitated in the bile, this form is due to an increase in the proportion of this substance. This explanation is shown to be of no value, since the experiments of Thomas have demonstrated that cholesterin neither increases nor diminishes in the bile, and is maintained at a nearly constant percentage in spite of variations in the dietary.

Since cholesterin belongs to the fatty series, the majority of physicians have held that an increase of cholesterin is due to a dietary too rich in hydro-carbons, or to an incomplete combustion of these hydro-carbons; hence, in accordance with this idea, they have suppressed fats and other hydro-carbonaceous elements in the dietary of persons suffering from hepatic gravel. To-day, it is necessary to abandon this view, and we find that if there is any special dietetic hygiene to be required of persons suffering from biliary calculi, it must be established upon some other basis. Others have sought to explain the precipitation of cholesterin by modifications occurring in the character of the bile. It is thus that Thudichum has maintained that the decomposition of glyco-cholic into choliac acid explains the liberation of cholesterin. Authors have sought to explain this phenomenon by the presence of calcareous salts. None of these ideas have been verified by experience.

The same is true respecting the view which saw in an exaggerated activity of the central nervous system the origin of the excessive amount of cholesterin. We must renounce all these theories and henceforth rely upon clinical investigations. These investigations show us two great facts, one of which has been clearly presented by Naunyn. It is, that there is always to be found in biliary calculi a nucleus of epithelial debris furnished by the mucous membrane of the diseased biliary passages. Another fact which I think has not been sufficiently emphasized by Naunyn, is the stasis of bile in the gall bladder.

Let us examine each of these facts. The presence of epithelial debris as a nucleus of biliary calculi, is an evident proof that the calculi are nearly always formed after an inflammation of the biliary ducts, including the gall bladder, a form of inflammation to which Naunyn gives the characteristic name of desquamative angiocholetis.

What is the origin of this angiocholetis? It results from the extension of the gastro-duodenal inflammation to the biliary passages, or, as we may add, an infection of the bile ducts. What is the source of this gastro-duodenal inflammation? It is the result of excessive alimentation or irritating foods, or the insufficient mastication of food.

The stasis of the bile in the gall bladder is as important a cause of biliary calculi as desquamative angiocholetis. One is the complement of the other. At first, inflammation hinders the outflow of the bile, and consequently occasions its accumulation in the gall bladder; deficient

exercise, and especially corset wearing, by interfering with the normal mobility of the liver, explains why biliary calculi are so frequently encountered in women.

Finally, irregularity in eating plays also a role in the retention of bile. We should not forget that in the physiological state each inspiratory movement depresses the liver upon the intestinal mass, and that by this means a more or less energetic pressure is exerted upon the gall bladder. As the mode of respiration in man is diaphragmatic and inferio-costal, while in women the type of respiration is superio-costal, and, adding to this mode of respiration the effect of the corset, it will easily be comprehended why biliary calculi are so frequent in women. As to eating, physiology show us that two hours after eating, the gall bladder tends to empty itself. It is, then, upon these two great facts, a proper dietetic regimen and proper exercise, that the hygiene of invalids suffering from biliary calculi must henceforth rest.

As regards dietetic regimen, we have to examine successively the choice of foods and the interval between meals. As I have just said respecting the choice of foods, we must absolutely abandon the proscription heretofore made, of carbonaceous and hydro-carbonaceous foods in cases of biliary calculi. These foods may be permitted, avoiding, however, an excess; but all irritating foods must be absolutely prohibited, and as the gastro-duodenitis always precedes the desquamative angiocholetis which is the immediate cause of the calculi, it is important to combat the first symptoms of this gastro-duodenitis by a dietary as simple as possible.

The basis of this dietary is to be found in the vegetarian regimen. Let us not forget, in fact, that this duodenal inflammation follows an exaggerated acidity of the gastric juice, and that this acidity is itself produced by an excess of proteid foods. You will then absolutely proscribe meats, and will require your patient to follow a regimen composed of eggs, grains, fresh vegetables, and fruits.

To inflammation as a cause of this desquamative angiocholetis, it is necessary to add infection; that is to say, the penetration of microbes from the intestine into the biliary passages. Putrescent meats, such as game, fish, shellfish (oysters, clams, etc.), lobsters, and crabs, being among the causes of this infection of the biliary passages, must be absolutely proscribed.

As regards the internal cause, it is necessary to be equally rigorous. Alcohol being one of the most frequent causes of gastro-duodenitis, it is necessary to forbid all alcoholic drinks, and to insist upon the use of soda water or milk. We have seen that alkaline waters are not cholagoguic in their action. It is not, then, by an increase of biliary secretion that their curative action can be explained. To my idea, their therapeutic effects must be attributed especially to the power which they possess of diminishing the gastro-enteritis by lessening the acidity of the gastric juice. Further, their general action upon the nutrition of the body also explains their favorable effects. It is not sufficient simply to prescribe a vegetarian regimen, abstinence from alcoholic drinks, and the use of alkaline waters. It is still necessary to require of the patient that he give to his meals sufficient time to secure the complete mastication of his food. Mialhe maintained, many years ago, that all dyspepsia is the result of insufficient mastication. Without going so far as this, one may say, however, that the presence of badly masticated foods is one of the most frequent causes of gastro-duodenitis. Such foods really act as foreign bodies which irritate the pyloric region of the stomach and the mucous membrane of the duodenum. The same is true of an excessive quantity of foods. Great eaters are very subject to gastritis. It is necessary, then, to eat rationally and to masticate slowly. As to the interval between the meals, it is necessary that it should not be too long, since we know that each meal aids the gall bladder in emptying itself. The invalid will be permitted to take, in addition to his breakfast and dinner, a little food on rising, and then at about three o'clock in the afternoon, so as to make four meals a day,—two large meals and two small ones. It should be well understood that this prescription applies only to patients whose stomachs are not dilated, who constitute, it is important to observe, the exception among those suffering from biliary calculi. The presence of biliary calculi in persons suffering from dilatation of the stomach, is easily explained, because there is often in such cases an irritation

of the duodenum and an infection of the biliary passages, circumstances favorable to the development of desquamative angiocholetis.

The stasis of the bile in the gall bladder may be combated by different means, some of which belong to the domain of pharmacy proper, others, to that of hygiene. Of the first class may be mentioned cholagogues, of which I especially recommend two drugs, evonymin and salicylate of soda. I was one of the first to make known the favorable action of evonymin, my first researches concerning which will be found in the thesis of one of my students, Dr. Davet. The following is the formula which I employ: ℞ Evonymin, medicinal soap ā ā, grains, 3.

Make into two pills, which are sufficient for one dose.

Salicylate of soda is also a good cholagogue. I often administer to men suffering from biliary calculi a dessertspoonful of the following solution after each meal: ℞ Soda salicylate, 15 grams, aqua 250 grams.

Salol with salicylate of bismuth is also a powerful cholagogue. A formula of my intestinal antiseptic powders may also be utilized. It is as follows: ℞ Salol, salicylate of bismuth, bicarbonate of soda ā ā, 10 grams. Divide into 30 powders.

You may employ podophyllon, cascaria, or the purgative mineral waters containing sulphate of soda, such as rubinat, villacabras, and carabana.

Finally, let us not forget that large rectal enemata act as cholagogues. This is the method of Krüll. Solutions of naphthol may be used for this purpose, as mentioned in the preceding lesson.

We have learned that respiration favors the flow of bile, by depressing the liver upon the intestinal mass, and thus compressing the gall bladder. It is necessary, then, to direct our patients to make full, deep inspirations by the employment of respiratory gymnastics. One of the most simple of these gymnastic exercises consists in making the patient count in a high key without taking breath.

It should be well understood that women must be required to wear their corsets loose, a thing often difficult to accomplish. In men, the wearing of belts must be forbidden, and they must be required to wear braces. Walking, and all bodily exercises, by increasing respiratory movements, become powerful adjuvants in the treatment of this disorder.

In such exercise, a true massage of the gall bladder is produced, but a direct pressure may be made upon the base of the gall bladder by means of abdominal massage administered by the methods of massotherapy. Finally, hydrotherapy, by improving the muscular tone, may also be advised in these cases.

These are the principal lines which should be followed in the treatment of biliary calculi. But two great indications must be met, to secure a cure: first, prevent the production of calculi; then combat, not the discharge of the calculi, but the painful symptoms which accompany the discharge, which are described under the name of hepatic colic.

One of the best means of combating the reflex spasm which originates in the irritation of the mucous membrane of the biliary passages, is the injection of morphia. It is in these cases that you would use morphia and atropia associated as in the following formula: ℞ Hydrochlorate of morphia, grams 0.10, sulphate of atropia, grams 0.01, aqua, sterilized, grams 20.00.

Inject with a hypodermic syringe in usual doses, repeating until pain is relieved.

(To be Concluded.)

Detection of Alkaloids in the Urine. — In an interesting series of articles in *Les Noveau Remedes*, for June 24, 1892, Dr. Bardet, of the Cochin Hospital, gives the following as the best reagents for detecting alkaloids or glucocides in the urine: —

Phospho-molybdate of soda. This salt in an acid solution (usually nitric) gives precipitates of greenish or bluish turbidity in liquids containing vegetable principles of a basic character, or of glucocides. This reagent is extremely sensitive.

Double iodide of mercury and potash. This test is generally known as Mayer's reagent. It is extremely sensitive. Nearly all solutions of alkaloids may be detected by this reagent. Glucocides are rarely precipitated by it. The following is the formula: —

Mercuric chloride gms. 13.446, Po s sium-iodide, gms. 49.800, Distilled water, 1 litre.

Morphia may be detected by this reagent, in a solution containing 4 parts in 10,000; Atropia, 15 parts in 100,000; Nicotine, 4 parts in 100,000; Strychnia, 66 parts in 10,000,000.

Mayer's reagent may also be used as a means of quantitative estimation. 1c.c. of the reagent corresponds to the following quantities of active principles: —

Strychnia .0167, Atropia .0195, Morphia .02, Nicotine .00405.

The quantities indicated are fractions of a gram. In use, it is only necessary to multiply the figures above given by the number of cubic centimeters required to precipitate all the alkaloid, in order to obtain the weight of the active substance contained in the solution.

Double iodide of cadmium and potash. This reagent, though less sensitive than the preceding, has the advantage of precipitating only the true alkaloids; it does not precipitate either the glucocides or the xanthic bases.

To detect an active principle in the urine, proceed as follows: Obtain all the urine passed for twenty-four hours. Reduce by evaporation to one tenth the original volume. Agitate with ether, then with chloroform. After filtration, evaporate these two liquids. Dissolve the residue in acidulated water, and apply the reagent.

The Toxic Properties of Bases Extracted from Muscular Tissue. — M. M. Gautier and Landi recently reported to the Academy of Science, Paris (June 20, 1892), the results of studies which they have conducted for the purpose of determining the physiological effects of the bases contained in muscular tissue. They divide these bases into four groups, as follows: 1. Xanthic bases; 2. Carbo-pyridic bases and their analogues; 3. Neurinic bases, hydro-pirroric bases, etc; 4. Creatinic bases.

The effects of these several classes of excrementitious agents are shown to be as follows: —

1. Xanthic bases are found in flesh only in very small proportions, and cannot be properly said to be poisons.

2. The carbo-pyridic bases and their liquids produce slight stupefaction of animals when administered in sufficient doses (1½ gms of chloro-hydrate per kilogramme of animal). They are not otherwise dangerous.

3. The neurinic, hydro-pirroric, and allied bases, whether extracted from flesh of muscular tissue or from preserved meat, are the most venomous of those which are precipitated by mercuric chloride. Injected in the mouse in dose of one centigramme of the chloro-hydrate, it causes death in two hours, after having produced dyspnœa and other symptoms of interference with respiration, spasmodic movements of the limbs, and alternations of paralysis and tetanic convulsion.

4. The creatinic bases injected under the skin, as the preceding, produced with the same doses, first, vomiting and diarrhœa, then tetanic shocks, and at the end of thirty minutes, paralysis of the limbs, and finally death at the end of an hour. The effects are the same, whether the bases are obtained from fresh meat or from preserved meat.

These effects are of the greatest importance, both from a hygienic and a therapeutic point of view, and furnish scientific foundation for the practice long ago established empirically by observing physicians, of withholding flesh food from patients suffering from acute febrile disorders.

The researches of modern bacteriology have shown that in most if not all acute disorders accompanied by febrile action, the system is laboring under the influence of poison generated within the body, as the result of the growth of microbes of varied character, the intensity of the febrile action depending upon the degree of accumulation of poison within the system. Most of these poisons are eliminated chiefly by the kidneys. It is only by the elimination of these poisons that the febrile action can be efficiently controlled, hence it is important that all possible means should be employed to aid the system in ridding itself of all disturbing poisons; and it is equally important that poisons of an allied character should not be introduced into the system either dietetically or otherwise.

Dr. Austin Flint some years ago called attention to the fact that fever patients were often starved to death by feeding upon excrementitious products, the effect of which, as a food, is practically nothing. These recent researches of Gautier and

Landi show that the extractives of meat are not only useless as foods, but are positively injurious as toxic agents.

It is scarcely necessary to emphasize further the importance of these observations and their practical bearing upon the hygiene and therapeutics of dietetics. There can be no question but that the vegetable kingdom furnishes, in fruits and grains and a few wholesome vegetables, the purest and most healthful nourishment.

In taking flesh food, one is only taking the products of the earth at second hand, and, as is now clearly shown by modern researches, a second-hand diet in the form of flesh food is deteriorative to a very marked degree. This view is quite contrary to the popular notion that food elements are somehow improved by transformation into animal substance, nevertheless it is based upon scientific facts of the most authoritative character, and must be accepted.

Thoracic Deformities in Young Men.— The *Revue d'Hygiene* in the June number, 1892, gives an abstract from *La Normandie*, of a very interesting paper upon thoracic deformities in young men, observed by comparing measurements taken by the tailors of Caen, of fifty individuals between the ages of eighteen and twenty-two years, thirty years ago, with those of the same number of persons recently measured.

In the style of coats worn thirty years ago in France, the anterior thoracic line corresponding to the opening of the coat was at a greater distance from the axillary seam than the recent patterns, which indicates a diminished convexity of the anterior thoracic wall, and a diminution of the capacity of the thorax. Each side of the anterior median line, and especially upon the extension of the mammary line, in men's coats, a piece was cut out to adapt the garment to the form, by diminishing the inferior diameter of the waist of the coat. At the present time, this piece must be replaced by an elliptical piece, because the thorax of young men tends to take the same diameter above and below.

The posterior thoracic line of the modern style of coat, that which corresponds to the middle back and seam of the garment, instead of being a vertical line, as in the style of garment worn thirty years ago, is curved with an anterior concavity in its upper part. This form is necessary, in order that the coat should not wrinkle, and should fit the back, which tends to roundness. Upon the individual orders of their patrons, the tailors were found to have written eighty times in one hundred the words, "Back round."

The deformities to which this change in the style of coat is due, may be summed up as follows: The chest is flattened, that is, the anterior thoracic wall no longer has its normal convexity; the back is round, that is to say, its line is convex when it should be straight. Finally, the superior and inferior diameters of the thorax tend to become equal, that is to say, while the inferior diameter has remained normal, or nearly so, the superior diameter has diminished, and equally, the capacity of the thorax has also diminished. These modifications are met with in about 80 per cent of young men. The normal type with the back straight or slightly concave, the chest prominent, and the waist curved, is now rarely seen.

Normal shoulders, that is to say, high shoulders, to employ a technical term of the tailor, are met with only about three times in one hundred. The neck is forward, the chest flattened, and the back rounded. This appearance of the average young men of eighteen or twenty years of age, of the present time, is recognized in every day observations; the hips are prominent, and the bust short. This feminine characteristic becomes very frequent in France, accompanied with a development of the mammæ which increases in appearance the thoracic circumference without really increasing the capacity of the thorax.

It is further noticed that the difference which should normally exist, and which is found in the ancient measurement, between the thoracic circumference taken at the nipple, and the abdominal circumference taken at the umbilicus, tends to diminish the latter; for example, in 1860, in a man of twenty years, the thoracic circumference was forty inches, and the abdominal, thirty-two inches. To-day the thoracic measurement is only thirty-five and one fifth inches, while the abdominal is thirty-two and four fifths inches.

These very important facts are of great

interest as showing the tendency to physical degeneration which results from our modern habits of life, neglect of physical culture, and too sedentary habits. The increase of the abdominal measurement is but a natural result of the depression of the thorax due to forward flexion of the body by sitting positions. Bad positions in standing and walking are the principal cause of this deformity. Posterior curvature of the spine, such as is described in the abstract above quoted, is the most common of all forms of deformity, though, curiously, it is the one least frequently mentioned, and has now for the most part been altogether overlooked by those who have made a special study of the deformities of this portion of the body.

New Views Respecting Alkaloidal Antagonism.— The researches of Nothnagel and Rossbach respecting the action of alkaloids, the potency of which is often so great that very energetic action follows a dose consisting of a few fractions of a milligramme, have shown that notwithstanding the action of these drugs in such small quantities, their activity is wholly the result of contact with the tissues. Each tissue-element possesses its own sensibility. The muscular and cellular tissues possess comparatively little sensibility, while the nervous system is almost infinitely sensitive. Any foreign body, when brought in contact with the elements of the nervous system, produces an extremely energetic reaction, even in most minute quantities, when of a chemical composition differing from that of the elements. This, of course, refers to bodies in solution. It is not the foreign substance which acts upon the nervous elements, but rather these are the living tissues which react upon or toward the foreign body.

Many substances when introduced into the body, quickly lose their peculiar characteristics by contact with the oxygen and other active elements found in the tissues. The poisonous alkaloids, however, are substances which preserve their identity, undergoing no essential change, so that they reach the nervous elements, and by their contact induce the characteristic reactions.

These recently established facts respecting the action of alkaloids are of practical importance, as they have a direct bearing upon the use of alkaloids of a supposed antagonistic character, either together, with a view of securing a modified physiological action, or in succession, with the purpose of antidoting the effect of an overdose. The idea that an alkaloid, the introduction of which into the system is followed by a physiological reaction opposite in character to that resulting from the use of another alkaloid is, consequently, an antidote for it, and may be safely utilized to combat a toxic action, has been shown by Rossbach and Fröhlich, who have established the following laws : —

1. There is no regular antagonism between the effects of two poisons.

2. The real action of alkaloid poisons can be only paralyzing or exciting.

3. The paralyzing action takes precedence, always, of the exciting action.

As an illustration of the above, it is well known that strychnia excites while alcohol paralyzes. If these two poisons were administered together, the alcohol prevents the strychnia from acting so long as its paralyzing action is exerted. If the strychnia is administered first, unless the dose be one sufficiently large to be immediately fatal in its effects, alcohol administered afterward may prevent the toxic effects of the strychnia from appearing.

4. After a paralyzing poison has been administered, the characteristic action of an exciting poison cannot be produced.

5. On the contrary, a paralyzing poison may always act when an exciting poison has been administered.

6. This antagonism can rarely ever be of use therapeutically, for it can be employed only in cases of poisoning by exciting agents, and then the administration of the paralyzing agent adds a new toxic action of a very dangerous character.

The Formation of Sugar from Peptones.— Mr. R. Lepine, in a recent note to the French Academy of Sciences, states that peptones coming in contact with the blood under certain conditions give rise to sugar. This may point to the origin of a portion of the sugar which is produced *in vitro* at 58° C. in the blood of a dog during digestion, or after having been bled. Until now this was thought by many writers to come exclusively from the glycogen of the blood.

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

The Treatment of Tuberculosis by Antiseptic Vaporizers. — Dr. Marche, in the *Journal de Medicine et de Chirurgie Pratiques*, describes a method of treatment of pulmonary phthisis in which he keeps his patients supplied with creosote much more thoroughly than is possible with the various modes of ingestion and inhalation. He keeps his patients in a room where vapors of creosote are continually produced. The success attending this treatment, is, to say the least, very remarkable. If this report is true, as we have every reason to hope, it would seem that this simple method of treatment would become popular and would be generalized.

Different Modes of Contagion in Tuberculosis. — M. Arthaud, in the *Revue Internationale de Bibliographie*, gives the result of a study of the origin of the different modes of inoculation in this disease. He studied minutely the method of contamination in 100 typical cases. In 17 of these he failed to find a plausible explanation of their inoculation. In the 80 remaining cases he established that the inoculations seem to have been induced by a long sojourn in lodgings contaminated by some preceding occupant, who had suffered from marked tuberculosis and had inhabited the same rooms for a long period, or had died therein. In all cases, with some variations, the primitive signs of invasion appeared after a sojourn in such lodgings, varying from one to four months. Dwelling places are not the only factors in contagion. The *Archives Medicales Belges*, in notes on M. Arthaud's investigations, justly says that the places of habitual reunions, the workshops, offices, etc., are so many very dangerous centers. The author indeed cites many striking examples. The balneary and other resorts frequented by consumptives are not exempt from reproach on this subject. M. Arthaud ends his communication in the following language: "1st, the most frequent mode of transmission of tuberculosis is contamination from the inhabited locality (rooms, etc.), and its relative frequency is about 80 per cent; 2nd, the excessive frequency depends on the negligence of all prophylactic measures; 3d, in instituting by legal means some very practical hygienic measures, it is reasonable to hope that tuberculosis will diminish in frequency and even die out as leprosy did among our ancestors."

A Mode of Infection of Milk Little Known. — Prof. Gaffky, in *Deut. Med. Woch.*, describes three cases of infectious enteritis having attacked simultaneously three employees of the Institute of Hygiene, of Giessen. Inquiry made on the subject demonstrated that the disease was produced by the ingestion of milk contaminated by means little suspected or at least little known, namely, the direct contamination of the milk by the dejections of a sick cow.

The disease began on the same day in all three cases, the symptoms, though of varying intensity, presented the same character; at the beginning cephalalgia, repeated chills, *malaise*. In the most severe case, there appeared afterward a high fever accompanied with some degree of stupor and profound andynamy; the tongue was coated, the abdomen distended and tender to pressure, the fæces frequent, scant, and of a dark brown color, partly liquid and holding in suspension particles and granules; on the 11th day an intestinal hemorrhage occurred. The urine was albuminous and contained, at the beginning, granular cylinders and white globules but no red corpuscles; these bodies disappeared rapidly, but the urine remained albuminous until convalescence. The fever began to fall the twelfth day, and about the nineteenth day the temperature regained its normal point. The most striking and persistent symptom of all was extreme weakness.

M. Gaffky concludes that these three patients were affected by milk of which all three had partaken on the eve of the appearance of the symptoms. The three parties had the day before brought to the laboratory a closed bottle of milk; the one most violently attacked drank the greatest quantity, the second drank but one cup, and the last the remainder. The milk had not been boiled, and having been ingested immediately on opening the bottle, could not have been contaminated by the air. Some conscientious

researches were made to discover the source of infection of the milk, and it was found that a cow was suffering from hemorrhagic enteritis, and still gave a little milk, which had been sent to the laboratory. Bacterial investigations of the dejections of the three patients and the sick cow, revealed a bacillus of small dimensions, very mobile, and susceptible of culture. Inoculation of these cultures in mice and guinea pigs proved extremely virulent and fatal in most cases; the same bacilli were found in sections of fragments of the mucous intestinal wall of the cow. The blood and milk withdrawn with the greatest aseptic care were examined and did not reveal any microbe of this kind. There is no question, we are too careless about this mode of infection.

The Bacillus of Cholera. — The *Archives de Medicine Experimentale* publishes the researches of M. A. F. Guyon, Interne of the Hospitals of Paris, which demonstrate to what degree such investigations may assist in the application of prophylactic measures against this disease.

Koch admitted at the beginning of his studies, that the bacillus of cholera resists desiccation but a few hours. He reasoned that this was due to the absence of spores, and that it would be impossible to disseminate the disease through the air, because the desiccated microbes that could thus be transferred would be dead. It was thought, therefore, that the virulence of the cholera bacillus existed only in a certain stage of moisture incompatible with their dispersion in the air. Later researches demonstrated great differences in this matter according to the cases. M. Guyon has attempted to elucidate these differences in a series of experiments in the laboratory of M. Strauss.

One fact of general application was demonstrated by these experiments; viz, that on the one hand rapid death of the cultures dried in ordinary air takes place, and on the other hand they resist when they are dried in dry air. Furthermore, other deeper experiments demonstrated that it is because of dryness of the medium that the bacilli survive, and that the hindering influence of ordinary air is evidently due to vapors of water which it contains. The oxidation which destroys the bacillus occurs more easily in the presence of humidity than in dry air, in which dry cultures are protected against the action of oxygen. This is in harmony with demonstrated facts in reference to other microbes. We know that dryness is one of the conditions of latent life. Desiccation, then, does not always signify harmlessness. The method and conditions of desiccation are to be considered in the destruction of virulence of any microbe, on the medium in which desiccation takes place.

The Penetration of Walls by Germs. — Dr. A. Serafini, Assistant at the Institute for Experimental Hygiene, Rome, has recently published the results of a very interesting series of experiments, the purpose of which was to determine the hygienic value of various sorts of building materials, in which are recorded observations which indicate that some species of germs have a remarkable penetrating power. Dr. Sanfelice, a colleague of the author, perforated the wall of the ancient hospital San Gallicano, at Rome, taking great care to collect only the dust which was obtained from the central portion of the wall. On planting some of this dust in nutritive gelatine, he observed the production of a number of microorganisms, the bacillus subtilis predominating. Other observers have reported similar results. Bonome found the bacillus of tetanus in the walls of an old church. Emmerich found the pneumobacillus of Friedländer in the walls of a prison. Uptadil produced an acute infection resembling malignant œdema by injecting guinea pigs with cultures obtained from the wall of one of the wards of the old hospital at Augsburg, a ward in which there had been cases of typhoid fever and septicæmia.

A question of interest which has not yet been fully settled by experiment, is whether organisms contained in the material of walls or which penetrate them from the outside, can emerge upon the surface and thus become a source of infection. Layet, in his interesting work upon this subject, answers the question in the affirmative, but no experimental evidence has been furnished. In experiments made by Serafini, it was found that germs diffused through water penetrated, without the aid of pressure, into handmade brick to a depth of four inches in twelve days.

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TUBERCULOSIS CONTRACTED AT HEALTH RESORTS.

A PATIENT who came under the observation of the writer not long since, confirmed an idea that he has had for some time; namely, that the flocking of people to unscientific health resorts is often attended with much danger. The patient in question was suffering only from overwork; his family history was clear, and there was no tuberculosis to be traced in his immediate kin or among his ancestors. He went to a health resort at a high altitude to recuperate. He boarded at a hotel in which numerous consumptives were coughing and expectorating; four months afterward, he developed tuberculosis and has now a typical case of pulmonary phthisis. The unfortunate condition of these resorts is, that there is, as a rule, no system, of disinfection of the rooms, verandas, hallways, etc. The patients are allowed, in most hotels, to expectorate where they choose without restriction; the result is, germs are scattered broadcast in the buildings and outside on the grounds; they become dry and are scattered in the air, and are inhaled by those exposed. Thus a health resort which in the beginning may have been exceedingly effective in combating consumption, becomes, after a time, a veritable center of infection.

It is claimed that the air is in itself, under all circumstances in high altitudes sufficient to destroy the germs of consumption. It is not so; tuberculosis cultures may be carried on in Colorado as in Michigan. One of the chief reasons why a high altitude is beneficial to consumptives in certain stages is because it gives to the system in various ways, more strength, more vitality, more fighting power, I may say, to resist the deadly microbes, and it renders the field (body) less fertile and less susceptible.

Doubtless the germs scattered outdoors at such a high altitude, particularly if moisture exists occasionally, will live but a short period, because, as pointed out by M. Arthaud and others, the desiccation of germs is fatal to them, when it occurs in a moist atmosphere such as is produced by dew, for instance. If desiccation occurs in dry air protected from moisture, as in a room, it seems that it is somewhat of a protection to the spores. Theoretically, then, the spores of tuberculosis expelled in dry air of a high altitude would, if inhaled by the proper subject, be liable to take root, and if that subject should descend to a lower altitude, might develop.

This history of the case which I have mentioned is clearly one of contagion in a polluted atmosphere. The beginning of the disease was noted slightly, or at least suspected while still in the infectious center; he left it, to go to a lower atmosphere, and at once began to sink under the dreadful ravages of tuberculosis. Again he had to return to a high altitude, to a place less inhabited by the sick, and where hygienic measures were carefully carried out by himself, and began to improve.

The point which I wish to draw attention to is, that persons who select resorts harboring patients suffering from tuberculosis, should be strictly on their guard, and that every hotel-keeper should regularly disinfect his premises. The establishments where no care is taken to disinfect the buildings, rooms, grounds, etc., are dangerous places for patients, even when

already suffering from the malady; for a tuberculous patient exposed to an air impregnated more or less with consumption germs, cannot do so well as in a clear, pure atmosphere. P. P.

CURETTING BEFORE LAPAROTOMY.

ALL gynecologists who have frequently performed the operation of removal of the uterine appendages have noted occasional cases in which the menstrual period continued after the operation, if only at irregular intervals, and this fact has given rise to a certain degree of skepticism as to the influence of the removal of the appendages in controlling menstruation. Several gynecologists of some note have given expression to the thought that the effect of the removal of the appendages upon the menstrual function is uncertain. A number of cases have occurred in the writer's practice, in which the catamenial flow continued for some months after the operation, and in several cases there was very pronounced menorrhagia. In two of the cases, uterine hemorrhage occurred at irregular intervals, apparently independent of any catamenial influence. A careful investigation of these cases developed the fact that, in every case in which profuse menorrhaghia existed, vegetations of the endometrium were present, and by removal of these, the hemorrhage ceased and the menopause was promptly established.

The writer agrees with the views of Dr. W. R. Pryor, who advocates in an article in the February number of the *Journal of Gynecology and Obstetrics*, thorough curetting of the uterus before laparotomy for removal of the appendages. It may not be best to do this in every case, particularly in cases of pyosalpinx. The most careful aseptic percautions might be insufficient to prevent the setting up of active inflammatory symptoms. By the employment of careful asepsis, the operation can be preformed in proper cases without setting up any inflammatory mischief in the pelvis and thus complicating the nature of the operation. It should be performed, as a rule, at least a week prior to the abdominal operation, but if necessary, may be performed at the same time, as but a few moments are required for its completion. In preparation for the operation, the vagina should be thoroughly washed and scrubbed with soapsuds made from good laundry soap, then irrigated with a 1-6000 solution of bichloride of mercury and packed with gauze soaked with 1–10,000 solution, and wrung dry as possible. The gauze packing should be placed the day before the operation.

A good method of cleansing the vagina is to wrap around the extremity of an ordinary douche tube a strip of gauze, making a mass as large as will easily enter the vaginal orifice. During the irrigation of the vagina with the soapsuds, the douche-tube thus prepared, may be used as a scrubbing-brush. Care should be taken to reach every portion of the vaginal surface, particular pains being taken to reach the area behind the cervix in the posterior *cul de sac*.

In every case of operation for control of hemorrhage, as in casesof bleeding fibroids, the operation should be preceded by a thorough curetting, and also before laparotomy for removal of the appendages in cases in which there has previously existed a so-called chronic endometritis or cervical catarrh. I have occasionally seen profuse hemorrhage occurring at irregular intervals in these cases after removal of the tubes and ovaries, although this symptom had not been present before the operation. The hemorrhage was controlled by curetting, which revealed the presence of a luxuriant growth of vegetations. It is probable that in these cases, the vegetations had existed before the operation, or, at least, a condition favorable to their development had previously existed. In two or three cases, irregular hemorrhages appeared several months after the operation,

and when the menopause had seemed to be fully established. It seemed clear, in these cases, that the vegetations had grown after the operation. The writer has several times found an abundant growth of vegetations in the uterus when the menstrual flow had not been more than usual in quantity, and one instance in which the menstrual flow had been scanty. These cases were encountered in following, as a routine, the practice of curetting the cavity of the uterus before closing up a lacerated cervix, this practice having been found of marked service in stimulating the process of involution in cases of sub-involution, and in suppressing a catarrhal discharge when present.

In the writer's opinion, many of the unpleasant symptoms of which the patient expects to be relieved by a laparotomy, but which often persist for many months subsequently, and sometimes bring the operation into discredit in consequnce of its apparent failure to accomplish what was expected of it, may be dissipated by a preliminary curetting.

J. H. K.

The Abuse of Mercury.— That mercury is a valuable remedy in some forms of disease cannot be disputed. That it is a most effective germicide is well known, and doubtless this property is what gives it its chief value as a remedial agent. The ancient notion that mercury is a cholagogue was long ago exploded by Bennett, in his experiments upon dogs, which were afterward confirmed by the elaborate researches of Rutherford. Doubtless the supposed cholagogic action of mercury is due to the germicidal properties of the drug, which, by lessening morbid fermentations and putrefactive processes in the intestine diminishes the amount of ptomaines which the liver is compelled to destroy, and hence enables this organ to do more efficient work in the performance of its bile-making and glycogenic functions.

The fact that mercury has sometimes proved so efficient a remedy, has led to its enormous abuse. The writer has endeavored to call attention to this fact in various ways and on various occasions during the last twenty years, and is now encouraged to see that so excellent an authority as Landolt is raising a vigorous protest against the abuse of mercury, especially in affections of the eye. As this acute observer remarks in the *Archive d'Ophthalmologie*, for February, 1892: "The doctor as well as the patient may sometimes be the victim of a species of auto-suggestion. The physician somehow becomes convinced of the great value of a remedy, without any scientific ground for his opinion, and yet he considers it a great fault if he does not administer it. This belief does not injure the patient, and may even assist in his recovery if he has faith in the remedy, provided the substances employed are of an inoffensive character. When so powerful and energetic a remedy as mercury is employed, however, the possible beneficial effect of the suggestion is purchased at too dear a price, since the mercurial treatment, by its deleterious effect upon the system, may deprive the physician of a most powerful ally in the curative action of a good constitution."

There is great wisdom in the last remark. The wise physician will ever keep in mind the fact that the curative action of the system itself, or the *vis medicatrix naturæ*, is of far greater value than any single remedy which could be employed in a majority of cases of disease.

J. H. K.

The Influence of Tobacco upon Digestion. — J. Ydan-Pouchkine recently reports in *Wratch*, the results of experiments upon seven healthy persons not addicted to smoking, for the purpose of determining the effects of tobacco upon digestion. He made careful examinations of the gastric juice for three days,

during which no tobacco was taken. At the end of that time, each of the seven persons experimented upon were allowed to smoke twenty-five cigarettes daily. The gastric juice was examined each day as before. The observations were also continued for an additional period of three days, after which the use of tobacco was discontinued. The results observed were as follows: —

1. Tobacco increases the quantity of gastric juice, but diminishes its acidity, a significant fact, when it is recalled that the degree of acidity of the gastric juice is the measure of its activity in the absence of abnormal acid fermentations.

2. The quantity of free hydrochloric acid in the gastric juice is diminished under the influence of tobacco.

3. Just in proportion as the free hydrochloric acid is diminished, the digestive power of the gastric juice is diminished.

4. Tobacco also diminished the activity of the rennet ferment contained in the gastric juice.

These facts should be carefully considered by those physicians who have been in the habit of recommending tobacco chewing to their dyspeptic patients as an aid to digestion. We have constantly noted the remarkable fact that tobacco smoking and chewing, though not infrequently recommended as an excellent remedy for certain dyspeptic conditions in men, are never prescribed for women suffering from identical conditions. There has never been the slightest scientific basis for such a recommendation, and the results of careful scientific experiment now presented by the authority above quoted furnish a most excellent reason for prohibiting tobacco, not only to those suffering from feeble digestion, but also to those who wish to keep their digestive organs in a healthy condition.

The tobacco habit is one of the most conspicuous blemishes upon our modern civilization. No apology can be offered for it which is not equally good, or better, for the alcohol habit, the opium habit, the cocaine habit, or the hasheesh habit. It is to be hoped that the time is not far distant when medical men as a class, will set their faces earnestly against poison habits of every description. Then, and not until then, can we hope for the beginning of a general reformation on the part of the laity. J. H. K.

The Infection of Milk.—A bacteriological note in this issue, on the subject of the infection of milk, suggests possibilities of infection of a varied character from this source. The case mentioned by Prof. Gaffky, in which infectious enteritis was produced by the ingestion of milk contaminated by the dejections of a sick cow, presents a more striking example of the transmission of a disease from a lower animal to man than is usually observed. There are numerous other affections, many of them much more dangerous, which may likewise be transmitted, as affections of the alimentary canal, and diseases affecting other most important organs. It has long been believed by some high authorities that the germs of typhoidfever are sometimes transmitted through milk to persons using it. There are many cases on record in which it seems as if the malady could have been produced in no other way. Not only the germs of diseases affecting animals may be transmitted to human beings, but also various poisonous germs existing in stables, on the bodies of the animals, in the dejections, etc.

Furthermore, such affections as tuberculosis, as has been so often shown, may be communicated directly to human beings through the milk of diseased cows.

Thus it would seem that too much care could not be taken in milking cows and preparing the milk for human consumption. It has been the duty of the writer, during his career in public office as a sanitarian, to inspect closely many dairies

supplying milk to cities, and he has seldom failed to find more or less contamination of some sort.

It is very seldom that milking is done in a very cleanly manner in large establishments, and what is called clean by most milkers is in reality only relatively so, and in fact often more or less filthy. The inspection of dairies in most cities where it exists at all, consists of chemical analyses having for their object the determination of the quality of the milk, so far as constituents are concerned. The germs that it may contain are seldom if ever inquired into. The question is not considered at all in most cases; in fact the inspectors are seldom competent to make bacteriological analyses.

There is need of a radical change in this department of hygiene, but it never will come until the public realizes the dangers of polluted milk and filthy dairies, and places inspection on a scientific basis, free from political influence. P. P.

Toxicity of the Urine in Epilepsy.— The remarkable researches of Bouchard and his student Rogers, which have been published from time to time within the last few years, have attached to the study of the toxicity of the urine, by means of intravenous injections of this secretion in rabbits and other animals, an importance which is apparently quite too little known and appreciated.

Bouchard has shown that the killing power of urine varies greatly in different pathological states, and his studies have clearly demonstrated the fact that there is an important relation between these variations and the systemic manifestations in various forms of the disease,—for example, in pneumonia it has been shown that the toxicity of the urine is greatly lessened during the early period of the disease; but when the period of resolution begins, the toxicity of the urine is increased several fold. From which the conclusion must be drawn, that in the early part of the disease, the toxines produced by the pneumococcus are retained in the system, and that the ability of the kidneys to eliminate the poisons ordinarily produced in the body, is lessened. When the period of resolution arrives, however, and the vital forces begin to gain the ascendency, the accumulated poisons are rapidly eliminated, giving to the urine an abnormal degree of toxicity.

M. Fere has recently been pursuing the same line of studies in relation to epilepsy, and has discovered that there is a great increase in the toxicity of the urine before the convulsive paroxysm characteristic of this disease, and during the period of physical excitation.

The researches of Bouchard show that the urine naturally contains a toxic agent capable of producing convulsions, since in many cases rabbits experimented upon die in convulsions.

It would seem that these experiments would throw some light upon the etiology of the disease, as it seems quite possible that epileptic seizures may be in part due to excessive accumulation within the body of the particular toxine capable of producing the symptoms present in this malady.

Another hypothesis is, of course, possible; *viz.*, that the disease may be due to an abnormal susceptibility developed in the spasm-center of the brain, so that a slight increase within the body of toxic agents eliminated through the kidneys, may have the effect of producing the explosion of energy which manifests itself as an epileptic seizure. J. H. K.

The Comparative Vital Resistance of Carnivorous and Vegetable-Eating Animals.— Bonnejoy, a French physician of some eminence, pointed out, a year or two ago, the interesting fact that the poison-destroying ability of animals, a property which resides chiefly in the blood corpuscles, the phagocytes, and the liver, differs in animals with their habits as regards diet, being greater in vegetable-

eating animals than in the carnivorous. This important and interesting observation has recently been confirmed by experiments conducted by Dr. W. Siebel, of Elberfeld, for the purpose of investigating the toxic properties of salophen. Dr. Siebel found that a rabbit showed no symptoms whatever after a dose of salophen equivalent to four grams per kilo, while a dog showed poisonous symptoms after ten grains of salophen per kilo administered in divided doses in the space of six hours.

These experiments do not indicate high toxic properties for salophen, but do show a far greater susceptibility to the action of blood poisons on the part of the dog.

The writer has undertaken some experiments for the further elucidation of this interesting physiological fact. A ready explanation of the susceptibility of the dog to poison is the fact that the blood corpuscles and the phagocytes as well as the liver are compelled to expend the greater part of their energy in the destruction of ptomaines and other poisons introduced with the food of the animal, a task not required of the vegetable-eating rabbit or other creatures which do not feed upon the flesh of animals. J. H. K.

REVIEWS.

"The Principles and Practice of Medicine. Designed for the Use of Practitioners and Students of Medicine." — By William Osler, M. D., Fellow of the Royal College of Physicians, Professor of Clinical Medicine in the University of Pennsylvania, Philadelphia, etc. D. Appleton & Co., New York.

This work of a little more than 1000 pages, is the latest American contribution to the already considerable list of text-books upon the practice of medicine which have been published in this country, and we think it not too much to say that it is one of the best. One can scarcely read a page without being impressed with the great care which has been taken to bring the work up to the very latest date in the inclusion of the results of scientific research, and in the exclusion of exploded theories and obsolete practices. In this respect, the work seems to us to be far ahead of any similar one which has appeared within the last dozen years.

The author gives the fullest assent to the germ theory of disease, and continually makes practical applications of the theory in his prescriptions for treatment. We are especially glad to note the very thorough and practical treatment of the subject of typhoid fever, which forms the introductory chapter of the work. The treatment of nervous diseases is also worthy of the highest commendation. The author seems to have found the happy mean between the extremely technical mode of treating the subject required for the specialist, and the concise, comprehensive, and practical manner of presentation required for the average practitioner.

In a work so complete in other respects, we are surprised to find no mention made of the remarkable work done by Bouchard and his pupil Rogers, in the study of the toxicity of the urine. In view of the facts presented by these authors, it seems impossible to ignore the importance of this line of investigation. The kidneys are the avenues through which the great majority of toxic substances, including the toxines formed by microbes in the alimentary canal, find their exit from the body, and the light which has been thrown upon a great variety of toxic symptoms, particularly the various infectious disorders, but also some chronic diseases, by a study of the toxic properties of the urine, after the intra-venous injection method of Bouchard, gives to the subject an importance which certainly entitles it to mention if not to complete elucidation in every modern treatise on the practice of medicine.

We should like, also, to have seen in this excellent work a mention of the methods of examination of gastric fluids perfected within the last year or two by Hayem and Winter, of Paris. The methods given by the author, which are essentially those of Boas, have been clearly shown by Hayem and Winter to be quite unreliable. It is true, as stated by the author, that the determination of the total acidity by acidimetry estimates "not only the free HCl, but that in combination;" but it is not true that shaking the gastric contents with ether will remove all the organic acids present. Each acid has its own coefficient of solution, when taken in an aqueous solution and shaken with ether, but a sufficient amount is left behind to constitute a serious source of error. It is also incorrect to employ this method as a means of determining the amount of *free* HCl, since the chlorine in combination with albumen possesses the same degree of acidifying function as does free HCl; so that, with a given total acidity, the chlorine present might be entirely in the form of free HCl, or free HCl might be absent, and chlorine present only in combined form. It is a matter of great practical importance to know whether the chlorine is in a free state, or whether it is combined with albumen, and whether the relation of the combined chlorine and free HCl is the normal one. The method of Hayem and Winter determines with absolute exactness the total amount of chlorine present, and the different conditions in which chlorine is found present, whether fixed with bases, combined with albumen, or in the state of free hydrochloric acid. It is thus possible to make a scientific classification of disorders in the chemical processes of the stomach, and to found thereon a rational mode of treatment for the relief of these disorders.

We also note that the author omits the mention of methyl-violet as a test for free hydrochloric acid. We have found this test to be one of the most delicate and reliable of the many which have been proposed, besides being very convenient in application.

On the whole, however, the work is, as we have before stated, the best of its kind which has recently appeared, and will doubtless soon find its way into the laboratory of every progressive physician.

J. H. K.

P. Blakiston, Son & Co., Philadelphia, Announce as in Press, "Materia Medica, Pharmacy, Pharmacology, and Therapeutics," by Wm. Hale White, M.D., F.R.C.P., etc., Physician to, and Lecturer on Materia Medica, at Guy's Hospital; Examiner in Materia Medica, Royal College of Physicians and Royal College of Surgeons, etc. American Copyright Edition, edited by Reynold W. Wilcox, M. A., M.D., Professor of Clinical Medicine at the New York Post-Graduate Medical School and Hospital, Assistant Visiting Physician Bellevue Hospital, etc. Printed in one compact, handy volume.

"Nursing in Abdominal Surgery and Diseases of Women," by Anna M. Fullerton, M. D., Physican in charge, and Obstetrician and Gynecologist to the Women's Hospital in Philadelphia. Published by P. Blakiston, Son & Co., Philadelphia.

This little work of 284 pages contains the best summary of the views generally held upon the subject treated, which has yet appeared. In fact, so far as we know, it is the only treatise of the sort which has yet been published. The work is eminently practical in its character, and the author has evidently taken great pains in its compilation. Abdominal surgery is so new and progressive a department of medicine, it will not be matter of surprise if few surgeons are found who agree exactly with many of the methods outlined and the specific directions given, as each successful operator has methods of his own to which he has been led by his own personal experience, which are, in his hands, most successful, and to which he naturally feels inclined to trust in preference to others. But certainly, every candid abdominal surgeon who peruses this work will find something which he will be glad to utilize. It would be too much to say that we indorse everything the work contains; but it is certainly too valuable a treatise to be omitted from the library of any nurse or physician who wishes to be thoroughly posted in this branch of surgical work.



WHERE TO SPEND THE WINTER!

AT THIS SEASON OF THE YEAR THOUSANDS OF INVALIDS ARE SERIOUSLY CONSIDERING THE QUESTION,—

WHERE CAN I SPEND THE MONTHS OF **November, December, January, February, AND March,**

WITH THE GREATEST PROFIT?

THE ANSWER to this question will depend upon what the individual wishes to accomplish by a sojourn away from home. If rest and recuperation are the chief requirement, the Southern and Pacific Coast States offer numerous attractions which draw throngs of semi-invalids and valetudinarians every year.

If, in addition to rest and recuperation, the invalid needs a careful study of his diseased conditions, and an intelligent regulation of diet, exercise, and all other health conditions,—in other words, scientific health culture, efficiently carried out by the aid of the best known medical means and appliances, thoroughly trained nurses and attendants, and competent physicians,—then the choice between the most desirable places becomes very much restricted. There are certainly few institutions in this country where the needs and desires of an earnest, health-seeking invalid can

be satisfactorily met. Such places can be counted on the fingers of one hand, and are, perhaps, little known because of the fact that the managers of such institutions are conducting them in a scientific, and in some instances a philanthropic spirit, and consequently do not employ as a means of winning patronage, the emblazoned advertisements, the truth-sacrificing circulars, and other advertising methods commonly resorted to by the proprietors of mineral springs establishments, bogus sanitariums, and other so-called "health institutions" and quasi-medical establishments, with which the country abounds.

The advertisements of these establishments do not appear in public prints or popular magazines because such advertising is closely akin to quackery, and brings those who employ it into bad company.

The managers of the Sanitarium at Battle Creek, Michigan, many years ago undertook to organize a thoroughly scientific institution which would represent rational medicine in its most advanced form, and would be exactly what it professed to be — an institution where patients are honestly and fairly dealt with, treated at reasonable rates, given kind attention and comfort, and opportunity for the recovery of health under the most favorable conditions. The majority of patients treated in this institution are sent to it by physicians who by personal acquaintance, or through the reports of their patients, have become thoroughly familiar with the character of the institution and its management.

BRIEF DESCRIPTION OF THE Sanitarium.

BATTLE CREEK, one of the most beautiful and prosperous cities of Michigan, is centrally located in the salubrious Peninsular State. Its population is 20,000, while its death rate is but seven per thousand. Battle Creek is situated on two great thoroughfares of railway travel between the East and the West, being at the junction of the Grand Trunk and the Michigan Central lines; and two other railways make it easy of access from the South.

The city has an electric railway and is lighted by electric lights. A great number of pleasant drives are afforded by its well-kept and shaded streets.

The Buildings are lighted by a 700-light plant, Edison incandescent system.

Safety Hydraulic Elevators. Outside stairways for fire escapes accessible from every window.

The Institution affords facilities for baths of every description: Turkish, Russian, vapor, electric, water baths of all kinds, and the electric light bath. Independent accommodations for ladies and gentlemen, sufficient for 80 persons at one time. More than 800 feet of glass for sun baths.

A General Parlor, 40 x 50 feet, is luxuriously furnished with Dhagistan rugs, easy chairs, etc. The Dining-Room has a seating capacity of 400, is beauti-

fully lighted and ventilated, and always cheerful. No kitchen smells. Cuisine unsurpassed; table service excellent. Everything an invalid needs, and special dietaries prepared as directed.



THE GYMNASIUM.

The Gymnasium, 85 x 45 feet, is supplied with every appliance for exercise, and furnishes special instruction and class drills in Delsarte and Swedish gymnastics, under a trained director. Exercise by prescription.

The Swedish Movement Department, both manual and mechanical, is the most extensive in the United States. Vibrating bars and seats, kneaders, rubbers, beaters, shakers, and manipulating appliances of all sorts.

The Electrical Department contains every improved appliance for medical applications of electricity, Galvanic, Faradic, Dynamic, and Static electrical apparatus and appliances for electrolysis, electro-cautery, etc.

An Aseptic Maternity on the cottage plan (steam heat and thorough ventilation), provides the best possible conditions for lying-in patients, with experienced professional attendance and rigorous aseptic management.

Special Departments for surgical cases, eye, ear, throat, and lung diseases, nervous diseases, genito-urinary diseases of men (non-specific), opium and alcohol habits, and diseases of women. A kindergarten and nursery, to keep the children happy and out of mischief.



SUMMER HOUSE AND FRESH-AIR INLET.

Three Fine Greenhouses, maintaining a magnificent collection of palms and various tropical flowers and plants, keep the house filled with bloom during the winter season. Flowers are everywhere indoors during the winter season. Patients can visit the greenhouse at any time without going out of doors.

Glass-Inclosed Sun-Parlors and Verandas for winter sunning and promenading.

Pure Water from sandstone rock.

There are from 250 to 300 Employes in the Sanitarium service the year round, of whom from 90 to 100 are medical attendants and nurses. Also seven thoroughly trained physicians, and a large corps of manipulators skilled in massage and the Ling system of Swedish movements.

The Sanitarium Training-School, in which our nurses are trained, is the largest and most popular in the United States. Its course of training is the most complete and thorough of any school.

Tri-Weekly Lectures on popular medical subjects by the physicians.

Abundant Means for Recreation indoors during inclement weather. Facilities for walking, driving, and horseback riding at all seasons.



MAIN ENTRANCE.

The Sanitarium is Not a Pleasure Resort nor a fashionable hotel, but an ideal place for invalids needing good nursing, the benefits of regular habits, and scientific professional care and treatment, and who desire to become permanently well.

The Sanitarium Nursery and Kindergarten. This enables mothers to bring little ones with them without being burdened with their care and supervision. The children have the advantages of kind and experienced teachers and ample playgrounds.

For Further Particulars, see large circular and card of rates.

J. H. KELLOGG, M. D., SUPT.,

Sanitarium, BATTLE CREEK, MICH.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., SEPTEMBER, 1892.

CLINICAL AND EXPERIMENTAL TUBERCULOSIS.

IN our investigations on the relative action of microbes and their products in the production of disease, we have made numerous experiments and observations on the relative effects of the bacillus of tuberculosis and the poisons which it generates. Inoculated separately, it is possible to observe the differences in effect, and the role which each of them plays individually; and then, by mixed inoculations, to show the action of the two together as occurs in accidental disease, or by inoculation of cultures or of sputum. Generally speaking, the effect of the germs of pure cultures, when inoculated in a healthy tissue, or in the pleural cavity, or in the lungs, or the peritoneum, differs somewhat from the inoculations made with infectious sputum.

Pure cultures produce a well-defined, clean-cut, usually uncomplicated tubercle, free from foreign micro-organisms. Inoculations with sputum usually cause the production of complicated pustules, abscesses, and occasionally irregular and non-typical tubercles contaminated by other germs and other productions. By separating from the culture media the substance which has been known for some time under the name of tuberculine, it is possible to inoculate the two separately, that is, the plant and its chemical poisonous product. Thus separated, the plant can still produce tubercles in which new chemical products arise; the tuberculine only causes a more or less pronounced disturbance of the circulation and nervous system, with more or less fever, without the formation of tubercles. The acute or the chronic form of the disease may be produced by the inoculation of pure or impure tuberculous cultures.

In observing the symptoms and fever of tuberculosis produced thus with pure cultures, and the tuberculosis which occurs accidentally, we observe parallel development. In both instances we observe acute and chronic forms. In the acute case, the disease more or less rapidly runs its course; tubercles do not gather in masses, but the germs seem rather to take a whole organ or several organs by storm, as it were, the germs developing with wonderful rapidity, and scattering through the blood and lymphatic circulations. In chronic cases, the germs localize and develop localized tubercles. They usually become, for a time at least, wholly surrounded by walls, through the efforts of nature. These cases may end in acute tuberculosis at a given time.

If now we consider the effects of the inoculation of tuberculine alone, we may observe, according to the dose administered, more or less symptoms of poisoning, with febrile reaction more or less intense. But in this, as in other kinds of poisoning, there is no period of incubation, no spreading of the disease in the organism, no generation of new poison; it is a pure, simple case of poisoning, in which the blood and nervous system are the most deeply interested. When these symptoms subside, either by death or recovery, no tubercles or true tuberculous lesions exist.

It is then possible to separate the germs of tuberculosis and their products, inoculate them separately, and watch the results of each, notwithstanding that so many antagonists of the bacterian theory claim that it cannot be done satisfactorily. The separation is possible by means of washing and filtering, as was explained in the article on the "Relative Role of Germs and Their Products," in Laboratory of Hygiene department, August number of this journal.

Recently MM. Drayfus-Brisac and Bruhl have published a most interesting work on the study of the different clinical forms of tuberculosis. They are divided into,—

A. Acute miliary tuberculosis with pyrexia, under which heading they have the following subheads: First, a typhoid form; and second, an attenuated form of pyrexia.

B. Miliary acute thoracic tuberculosis, under which heading they count: First, the suffocating form; second, a bronchial or broncho-pneumonic form; and third, a pleural form.

In this very complete work the authors dem-

onstrate very clearly that there exist two very distinct forms of acute tuberculosis, one in which the infection is general, and the morbid poison of which reaches various portions of the body through the blood and lymph; another in which the acute symptoms are localized in the chest—it is a local affection of the lung, in fact, where the microbes have penetrated by means of the bronchials.

We might likewise subdivide the chronic forms of consumption according to their localization and pathological nature.

Thus, to sum up, tuberculosis is a disease which is essentially due to the bacillus of Koch, and the poisons generated are only a part of the factors in causing illness and death. The symptoms and course of the malady, taking all complications into account, are of vast importance in therapeutics.

In the treatment of tuberculosis, therefore, it is well to remember these facts, for whereas the chronic affection or the local acute affection might yield to certain forms of treatment, generalized tuberculosis and most other forms of localized acute tuberculosis are not thus amenable to treatment. These facts should play a very important role in the deliberations of the physician, in determining whether or not to send a patient away, and to what distant climate this or that consumptive should go for health.

Acute cases, local or general, do not do well at a high altitude; in fact, a majority of them would be and really are injured, or are sometimes killed outright by the production of hemorrhages, etc. P. P.

ANALYSIS OF STOMACH FLUIDS.

The recent work of Hayem and Winter, two of the leading physiological chemists of Paris, has thrown wonderful light upon the chemistry of digestion. Their plan of investigating stomach fluids was quite fully presented in an article by the writer in the August number of this journal. An extended investigation of the relation of various foods, medicines, and hygienic conditions to the chemical process of the stomach, is being carried on in the Sanitarium Laboratory of Hygiene at the present time, the full results of which will be reported in a future number. Nearly four hundred analyses of stomach fluid have been made in the Laboratory up to present date. We translate the following description of the method from the work entitled, "Du Chimisme Stomacal," by Hayem and Winter:—

"Place in three capsules designated respectively as *a*, *b*, and *c*, 5 c. c. each of the stomach liquid previously well filtered.

"To capsule *a*, add an excess of carbonate of soda; then evaporate all the capsules to dryness on the water-bath, after which proceed as follows:—

"Carry capsule *a* progressively and cautiously to a red heat, avoiding a higher temperature. To hasten destruction of the organic matters, and to diminish the action of the heat, the dried residue should be broken and stirred frequently with a glass rod.

"The capsule should be withdrawn from the heat when the points of ignition are no longer visible, and when the mass becomes pasty by the beginning of the fusion of the carbonate of soda.

"The calcination should be just sufficient to produce a colorless solution. After cooling, add distilled water and a slight excess of pure nitric acid boiled, to drive off the excess of carbolic acid. Then neutralize the solution, or even render it slightly alkaline by the addition of pure carbonate of lime or soda. In employing carbonate of soda, the limit of alkalinity is indicated by an abundant precipitation of calcareous salts which carry down all the carbon.

"After filtration with Berzelius's filter paper, and washing the residue with boiling water, the amount of chlorine present is determined by a decinormal solution of nitrate of silver in presence of neutral chromate of potash.

"The addition, as stated above, of a slight excess of nitric acid, favors the separation of the carbon. The final addition of the carbonate of soda in very slight excess, increases the sensibility of the indicator without interfering with the reaction.

"Proceeding in the manner above described, and taking all the necessary precautions, absolutely constant results may be obtained with the same liquid. The sensitiveness of the method with the chromate of silver is great.

"The figures furnished by *a*, and expressed in HCl, represent the total amount of chlorine contained in the stomach liquid.

"(*b*.) After prolonged evaporation at 100° C., for an hour after the disappearance of all liquid, add an excess of carbonate of soda again; evaporate again, and proceed as before for the determination of the amount of chlorine present.

"The figures furnished by capsule *b* represent the total chlorine less that which has been driven off by prolonged evaporation on the water-bath, that is to say, less the free hydrochloric acid; $a-b=$ free HCl.

"By evaporation on the water-bath at 100°,

ized gelatine. 10. A number of test-tubes with sterilized nutrient bouillon. 11. A few Erley- the same results are obtained as in an oven at 110°; but if the last temperature is exceeded even very slightly, the mass gives off white fumes, and the results are vitiated. So, for constant results, it is better to employ prolonged evaporation on the water-bath.

"(*c*.) After drying, capsule *c* is calcined with care, without the addition of soda. By breaking the residue, the calcination is hastened, and requires but a short time. Here, especially, excessive elevation of temperature must be avoided. The heat is arrested when the carbon becomes well dried and friable. The capsule should be quite deep, and only the bottom should be touched by flame, the upper portion being protected by wire cloth. After cooling, proceed as before.

"The figures obtained from *b* represent the amount of fixed chlorides, consequently *b*—*c* will give the amount of chlorine lost during the calcination of the residue of capsule *c*, that is to say, the combined chlorine."

The following cases in actual practice will illustrate the mode of utilizing the data obtained by the method above described. The stomach fluid tested by the color reagents gave a Congo-red, very slight reaction with methyl-violet. For capsule *a*, .320 gms. For capsule *b*, .264 gms. For capsule *c*, .056 gms. From this data we obtain the amount of HCl and combined chlorine, expressed as hydrochloric acid. 320 (a)—264 (b)=56 (H), the amount of free hydrochloric acid. .264 (b)—.056 (c)=.208, the amount of chlorine combined with albumen, represented by (C). The total acidity was found to be .128. Substituting these figures for the symbols in the following formula $\frac{A-H}{C}=a$ (for explanation of which see article in August number, entitled, "The New Chemistry of the Stomach"), we have $\frac{.128-.056}{.208}=(a)$, which, worked out, gives us as the value of (a) .34.

We now have for examination the following quantities: The total acidity (A) .128; coefficient (*a*) .34; total chlorine (T) expressed as HCl, .320; free HCl, .056; organic chlorides or combined albumen (C) .208. Comparing these quantities with the table of normal variations found on page 327 of the August number, and writing out the corresponding formula, we have, $A-a-T=\frac{H+}{C+}\}+$, which will be recognized at once by the great excess of free hydrochloric acid and combined chlorine as a case of hyperpepsia, notwithstanding the absence of hyper-acidity.

From the formula, A

ing .86 for coefficient, the normal value of (*a*), and introducing the figures obtained and multiplying, we have .128 as the value of A′, which represents the acidity which the amount of free and combined hydrochloric acid would produce if the chloro-albumen compounds were normal, .208 × .86 = .178 + .056 = .234. The difference between .128 and the actual acidity (A—A′), is .10106, a deficiency which is expressed in the figures shown for coefficient (*a*), .34, which expresses the quality of the useful work done by the stomach. In this particular case the amount of work done by the stomach is ample in all respects, but the quality of the work done is poor. After an analysis of this sort there need be no hesitancy in deciding what needs to be done for a patient.

As the Sanitarium Laboratory is the only institution of the kind in this country at the present time which is carrying on investigations of this sort, the managers have decided to place their facilities at the disposal of the medical profession for analysis of stomach fluids, when the fluid can be received at the Laboratory without too great lapse of time after removal from the patient. One such examination will be made without charge for any physician who is a subscriber to this journal. In other cases, the sum of $2 will be charged for the examination, which requires several hours of painstaking work in each individual case. Those who wish to avail themselves of this offer should write for directions for obtaining and sending the stomach fluid.

TECHNIQUE.

The Test for the Comma Bacillus.—In view of an impending epidemic of cholera in this city, and probably in the greater portion of the other cities this side of the Atlantic, I desire to give your readers the usual method of examination of dejecta of suspected patients, as practiced in the Bacteriological Institute at Berlin.

The articles necessary for the examination are: 1. A microscope with Abbe's condenser and the oil-immersion system. 2. A solution of fuchsin 1 gm. (Rubin) in 90 c. c. distilled water and 10 c. c. alcohol. 3. A few pipettes, glass rods, object-glasses or cover-glasses, and slides. 4. A few platinum wires melted or soldered to the end of glass rods. 5. A few hollow slides. 6. Ten to twelve glass plates or glass panes about 12 ctm. long and 9 ctm. wide. 7. About a dozen ordinary flat plates. 8. An alcohol lamp, or gas being preferable, a Bunsen burner. 9. A number of test-tubes with steril-

mer's glasses, about one third filled with 1 per cent peptone solution: 1 gm. peptone, 0.5 gm. chloride of sodium, 100 gms. distilled water. 12. Concentrated sulphuric acid.

The dejecta of suspected patients are scattered in as thin a film as possible on a plate, and this is carefully examined with the aid of a platinum wire for a mucous flake, "Schleimflocke," which is laid on the edge of the plate and isolated.

From this we take a piece the size of a pin-head, and sterilize a platinum loop (by drawing it through a Bunsen burner), and then rub it on a cover-glass until it is evenly divided; then remove all superfluous material by pressing another cover-glass over it, and allow it to get air-dry.

Then draw it three times through a Bunsen burner in the same manner as we proceed in the examination of sputa for the tubercle bacillus, and by means of a pipette add a few drops of the fuchsin solution for about one to two minutes to the cover-glass, and then wash it off in distilled water. Then add a drop of water to the cover-glass, lay it on a slide, and examine it with the oil-immersion system.

If we wish to preserve the specimen, we could, after staining with the fuchsin solution, wash off the excess of stain with distilled water, and allow it to get thoroughly air-dry, then add some Canada balsam.

In some cases, called "foudroyant," where the intestinal contents have a colorless or pale red color, with slimy (mucous) flakes or with a flour-soup mass, we will frequently find, especially, however, in the reaction period with cases running a slow course, no mucous flakes, but large quantities of blood. Here there are, besides cholera bacilli, large quantities of other micro-organisms, and sometimes only the cholera bacilli sparingly, so it is advisable, to render a diagnosis absolutely positive, to add to microscopical examination the examination by the aid of "cultures."

Cultures can best be made in "hollow slides" by smearing the border with vaseline, then bringing a small drop (from a platinum loop) of sterilized bouillon into this hollowed groove of the slide, and inoculating this latter bouillon with the smallest possible particle of the suspected mucous flake. The cover-glass is carefully laid on the vaseline, which serves to render the groove air-tight, and also prevents the evaporation of this drop of sterilized bouillon, which is then laid aside in a temperature of 20° to 22°C. The room can be heated if the temperature of the air is below this. It takes about twenty hours to have the bouillon turbid, and this slide (hollowed, containing the infected bouillon) can be examined with the oil-immersion without disturbing the culture. The best place to examine is the border line, and even if but few cholera bacilli were formerly present, they grow so rapidly that they will be easily recognized by their curved shape.

Culture Method by Schottelius.—Take 100 to 200 c. c. of the suspected dejecta from intestinal contents, and place them in a beaker glass containing 250 to 500 c. c. of mild alkaline meat bouillon, and mix thoroughly; then let this mass stand twelve to twenty-four hours at a temperature of 30° to 40° C. After this time the cholera bacilli have usually increased in numbers, and are found on the upper layer of the fluid. Introducing at the upper layer a platinum loop, and taking out a small drop (about the size of a lenten seed) and rubbing it on a clean cover-glass, we allow it to dry thoroughly (air dry); then draw it three times through a flame to fix it, and finally stain, as previously described, with the fuchsin solution.

Post-mortem Tests.—To examine suspected intestinal contents, I open the abdominal cavity carefully, and ligate, with the aid of two stout cords or twine, a piece of the ileum (about three to four centimeters in length), well filled with fecal contents, near the cæcum. It is well to apply a ligature close to the upper ligature, and another below the lower ligature, and cut between the two ligatures, so that the intestinal contents will not be spilled in the abdominal cavity and prevent the completion of the autopsy. It is well to cut out a piece of the intestine, about three to four centimeters in length, from the upper portion of the ileum, and to lay its excised portions in ordinary water until ready for use, *i. e.*, examination of contents. The method is the same as has been described, *i. e.*, take a small piece of floculent mucus, about the size of a pin-head, and examine it. Gelatine stroke and stick cultures, and also potato cultures, can be made for examination. They also grow on blood serum and agar.

Human beings are usually infected through the mouth, *i. e.*, through food, etc.; but it is found that if the stomach is partly filled and has sour reaction (gastric juice), the latter acts as a barrier to the infectious material.

Cholera bacilli require for their growth a mild alkaline nutrient medium, and are very sensitive regarding mineral acids.

By adding 0.07 to 0.08 per cent of muriatic or nitric acid to a neutral nutrient solution, the growth of the bacilli was stopped. This statement is found in Günther's "Bakteriologie," p. 210, and is made by Kitaseta.—*Louis Fischer, M. D., in N. Y. Med. Record.*

PUBLISHERS' DEPARTMENT.

SALOPHEN IN ACUTE RHEUMATISM.— From recent reports it appears evident that the new organic compound, acetylpara-amidosalol, or salophen, is to take a very high place in therapeutics; not only in acute rheumatoid maladies, but in those in which a principal object of treatment is to secure an undisturbed and continuous intestinal antisepsis without risk of injury to the patient.

The New York *Medical Journal* of July 30, 1892, contains an article on salophen, written by William H. Flint, M. D., of the Presbyterian Hospital, which foreshadows some of the excellent effects which may now be expected from this extraordinary new remedy.

Dr. Flint says that during his summer hospital service, he caused salophen to be administered to all cases of rheumatism, and that he was so well pleased with its action that he "desires to make known to his confreres the advantages of salophen treatment, hoping their results may be as happy as his own."

The author presents detailed reports of six cases of acute rheumatism treated with salophen in 15-grain doses, given dry upon the tongue, and swallowed with cool water, every three hours, and with sodium bicarbonate, in 10-grain doses, administered in the same way, thrice daily.

Dr. Flint's conclusions concerning the results obtained are stated by him as follows :—

"From the above given histories it will be seen that in all the cases except the last, the pains were quite relieved, the redness dispelled, and the temperature reduced to the normal point on *the second or third day of treatment.* In the exceptional case the patient may have exaggerated the intensity of her pain to prolong her stay in the hospital; but no objective symptom persisted, after the seventh day of treatment. It is probable that a speedier result may be safely obtained by the use of larger doses, or of the same doses at shorter intervals. In none of the cases was the heart's action at all weakened, nor was the digestion impaired by the remedy. The urine was unaffected by the treatment."

The writer concludes that: "We possess in salophen a remedy equally potent as the other salicylates to control the symptoms of acute rheumatic arthrites, but devoid of their tendency to weaken the heart's action, to disturb the stomach, and to produce albuminuria and smoky urine."

It will be observed, as hinted by Dr. Flint, that he might, had he so desired, have used larger doses of salophen, as, indeed, others have done; but many will agree that our best and most lasting results are often obtained with medium or small doses.

Dr. Flint adds: "It is the writer's purpose to conduct a series of experiments with a view of ascertaining whether salophen may be made available for securing intestinal antisepsis." We are glad to learn of this intention, not only on account of the author's well-known reputation in the treatment of gastro-intestinal maladies, but because other observers have already spoken of the value of salophen in such formidable affections as gastrectasis and other severe conditions of which abnormal fermentations constitute a symptom.

Bouchard's experiments, reported a few years ago in an interesting and excellent work entitled "Auto-Intoxications," show very clearly an important relation between intestinal sepsis and rheumatism. A large proportion of the cases of rheumatism investigated, were suffering from dilatation of the stomach, one of the most potent of all causes of abnormal fermentation and decomposition in the alimentary canal. It seems very probable, although we have no personal experience on which to base the suggestion, that salophen is beneficial to rheumatism, as shown by Dr. Flint's observations, through its activity as an antiseptic agent. We shall await with interest the report of Dr. Flint's further investigations.

A VIEW OF THE WORLD'S FAIR BUILDINGS in the form of a large-sized lithograph, in eight colors, with key to same, can be had by sending your address with twenty cents in postage stamps, to Geo. H. Heafford, G. P. A., Chicago, Milwaukee & St. Paul R'y, Chicago, Ill. As the supply is limited, applications must be made early. Should the supply become exhausted, the postage stamps will be returned to applicant.

NORTH STAR POINTS is the title of a book of reference for all points between Chicago and Lake Superior on the line of the Milwaukee & Northern R. R., and is a valuable publication for business men and tourists who may be interested in the development of the agricultural, mineral, and timber resources of Northern Wisconsin and the upper peninsula of Michigan. This book, together with an illustrated pamphlet telling "Where the Trout Hide," will be sent free upon application to Geo. H. Heafford, General Passenger Agent "North Star Route," Chicago, Ill., or to Harry Mercer, Michigan Pass. Agent, 82 Griswold St., Detroit, Mich.

THE MISSISSIPPI VALLEY MEDICAL ASSOCIATION will hold its eighteenth annual session at Cincinnati, Wednesday, Thursday, and Friday, Oct., 12, 13, and 14, 1892. The program is a valuable one, containing many of the most prominent names in the profession. It covers every department in medicine. The attendance will be unusually large, as Cincinnati is the center of population of the United States. Not only the scientific, but also the social part of the meeting will be of the highest order. The interest of the convention will be augmented by the meeting of the officers of the Pan-American Medical Congress, also other bodies of medical men. Dr. Benjamin Ward Richardson has written his earnest desire to be present. The Association will be just in time and just in line for those en route to the American Public Health Association in the City of Mexico. Among the many prominent gentlemen who are expected to read are the following: Dr. Hunter McGuire, Richmond, Va., President of the American Medical Association, the address on Surgery; Dr. Hobart Amory Hare, professor of Materia Med-

ica Jefferson Medical College, Philadelphia, the address on Medicine. Papers are expected by Drs. Reed, Ricketts, Hall, Dowling, Ayres, Connor, Ransohoff, Hoffe, Dandridge, Comegys, Whittaker, Zenner, Zinke, Cincinnati; Cook, Woodburn, Thompson, Indianapolis; Owen, Walker, Evansville; Lydston, Moyer, Belfield, Hamilton, Chicago; Mathews, Wathen, Larrabee, Reynolds, Renner, Louisville; Savage, Nashville; McGahan, Chattanooga; Dixon, Henderson; Hughes, Love, Loeb, Dalton, Borck, Bond, Hulbert, McIntyre, Ohmann-Dumesnil, Lewis, St. Louis; Lanphear, Kansas City; Smith, Montreal; Sutton, Murdock, Daly, Pittsburgh; Early, Ridgway, Potter, Thornbury, Buffalo; Baker, Cleveland, Thorn, North, Toledo; Walker, Detroit; Jones, Eaton, Baldwin, Columbus; Bond, Richmond. C. A. L. Reed, M. D., President, Cincinnati; E. S. McKee, M. D., Secretary, Cincinnati.

"NEW FACTS ABOUT THE DAKOTAS" is the title of the latest illustrated pamphlet issued by the Chicago, Milwaukee & St. Paul Ry., regarding those growing States, whose wonderful crops the past season have attracted the attention of the whole country. It is full of facts of special interest for all not satisfied with their present location. Send to Harry Mercer, Michigan Pass. Agent, 82 Griswold St., Detroit, Mich., for a copy free of expense.

MANY physicians are recommending the use of Horlick's Malted Milk as a table drink in place of tea, coffee, cocoa, etc. The evil effects of the long-continued use of tea or coffee are well known, but the difficulty has been to provide a pleasant and satisfactory substitute. Malted milk, served either hot or iced, makes one of the most pleasant, refreshing, and nutritious drinks imaginable, little if any more expensive than the ordinary drinks, and of course far more healthy and nutritious. Does not stimulate but aids digestion. Prepared by simply adding water. Address the Malted Milk Co., Racine, Wis., for samples.

CONTENTS OF LIPPINCOTT'S MAGAZINE FOR OCTOBER.—"The Kiss of Gold" (illustrated), Kate Jordan; "Hearing my Requiem" (Journalist series), George Alfred Townsend; "The Prayer-Cure in the Pines" (poem), Clarence H. Pearson; "At the Stage Door" (illustrated), Robert N. Stephens; "The Carnival at St. Louis" (illustrated), James Cox; "Unconscious Service" (poem), Margaret J. Preston; "Muscle-Building" (Athletic series), Edwin Checkley; "Old Paris" (illustrated), Sigmund J. Cauffman; "Under the Harvest-Moon" (poem), Helen Marion Burnside; "James Russell Lowell," Richard Henry Stoddard; "Christopher Columbus" (poem), John B. Tabb; "Men of the Day," M. Crafton; "As it Seems;" "With the Wits" (illustrated by leading artists).

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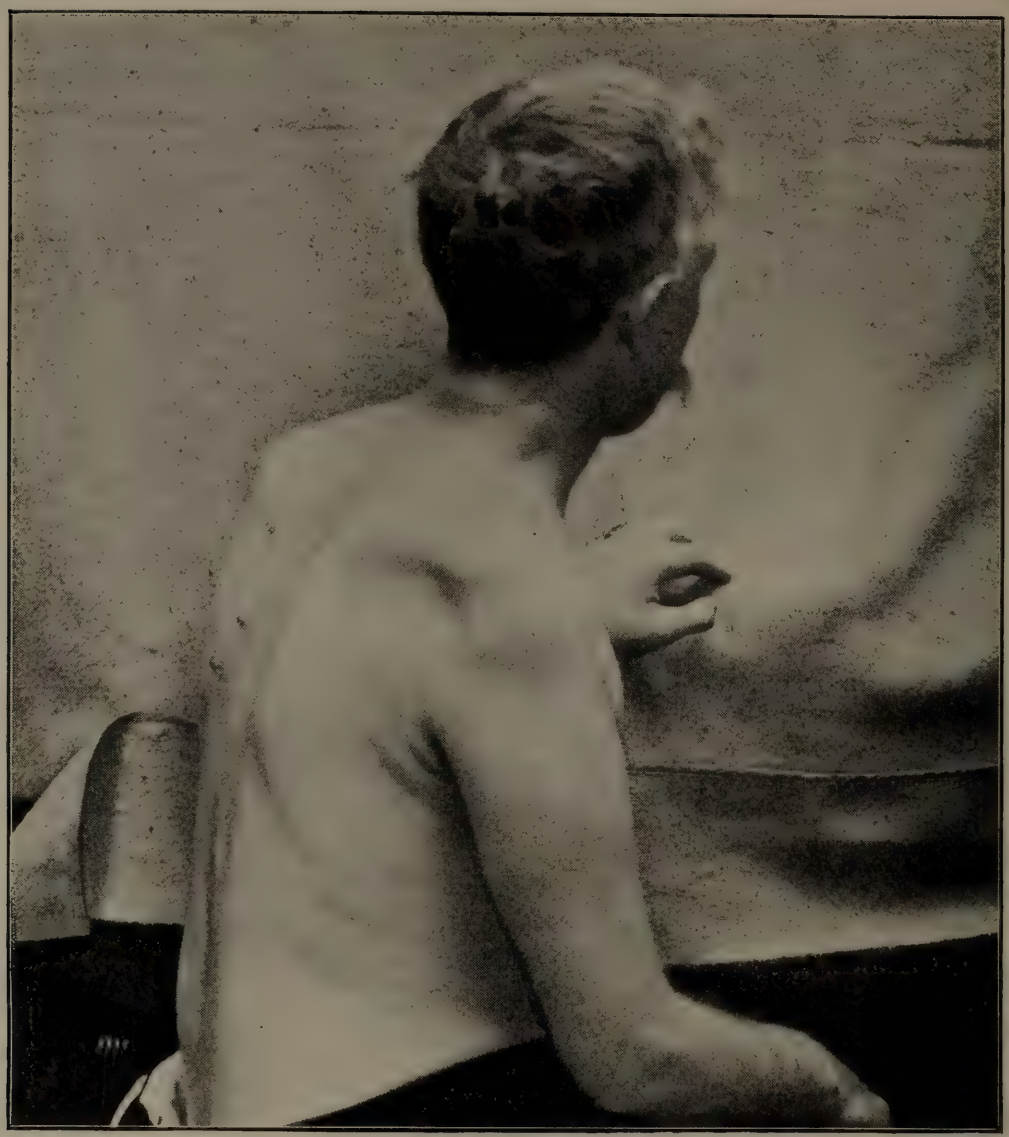


Fig. 2. — Early stage of progressive muscular atrophy, showing atrophy of deltoid, supraspinatus, and infraspinatus muscles of right shoulder.

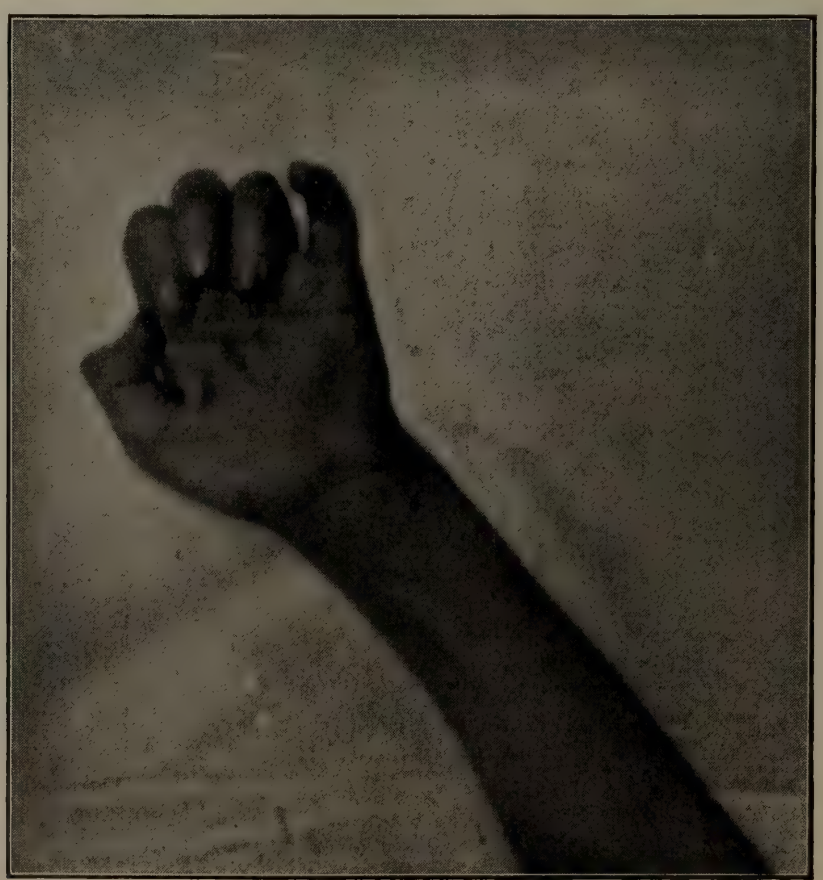


Fig. 1. — Atrophy of lumbricales and interosseous muscles, with contraction of long flexors of fingers, producing the "Claw-like hand."

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BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., OCTOBER, 1892. NO. 12.

THE STUDY OF IMMUNITY.

BY M. METCHNIKOFF.

V. THE PROPERTY OF THE MICROBE OF HOG CHOLERA IN THE ORGANISM OF A RABBIT.

We could never believe that the coccobacillus of hog cholera, with its thin envelope and its poor aspect, should be in a condition to live long in a body absolutely refractory to this microbe. And yet, inoculated in the skin of these rabbits, it provokes a protective suppuration, and maintains its life about three weeks. The pus withdrawn after a few days or more from the subcutaneous abscesses of the rabbit, presents, under the microscope, quite a mass of living and dead leucocytes, in which there are no microbes to be found. But it suffices to sow a little of this pus in broth to obtain an abundant culture of *Coccobacillus suinum*, — culture always very virulent.

The microbes end, however, by perishing in the pus, and, if it is withdrawn in about three weeks after the inoculation of the virus, the inoculated broth remains perfectly clear and sterile.

Often enough, the subcutaneous abscesses end by opening at the exterior, by which the animal is relieved of a quantity of pus; in other cases the abscesses remain closed and absorb slowly. Two months after the inoculation, the abscess is still voluminous enough, and contains a very thick white pus. Later, it diminishes and is transformed into a brownish mass diminished in thickness. In all these cases, the pus is sterile, and we find in it no remains of destroyed microbes. The bacteria capable of resisting so long in the refractory organism finally end in death: their death occurs, not in the liquid, but in the interior of the phagocytes. If the pus is withdrawn forty-eight hours after the subcutaneous inoculation of the rabbit, the microscope already fails to reveal the microbes. But if a little of this pus is placed in the incubator at 38° C., it is easy to observe that the leucocytes contain masses of bacteria of hog cholera which take on coloring in a most normal manner. These bacteria appear in the form of small oval bacilli, diplobacteria, and also of beads. They develop in the interior of the pus globules and invade the liquid, in which they produce a perfect culture.

These facts demonstrate that the microbes are englobed alive by the pus leucocytes, but that some of the bacteria resist, and when transported to conditions unfavorable to the phagocytes, invade the pus.

The long resistance of the englobed bacteria, gives us to understand that in a few unfavorable circumstances for the organism of the rabbit, the microbe succeeds in developing and killing its host. It is thus that we may explain more easily, the case in which a vaccinated rabbit, tested with vital virus, succumbed at last to pyemia. This disease was provoked by the microbe of hog cholera, and occurred nearly a month after the last inoculation of the virus.

The observation that I have just cited, renders it probable that the microbe, able to resist a long time in the vaccinated rabbit, may end by adapting itself to the medium, and in a favorable moment invade the organism. This should demonstrate that the englobed coccobacilli preserve, not only their vitality, but their virulence in the interior of the phagocytes. The last proposition may be easily studied, because very minute doses suffice to provoke a deadly form of the disease in rabbits.

The pus of the refractory rabbits in which hog cholera bacteria exist in the interior of the leucocytes, is virulent. I

have observed this important fact many times. The pus withdrawn forty-eight hours after inoculation of the vaccinated and refractory rabbit, killed the rabbit (in which it had been injected in the auricular vein) in forty hours. In other experiments the virulence was still more marked. A drop of pus from an inoculated rabbit, withdrawn four days after the inoculation of the virus, and injected in the vein of another rabbit, produced hog cholera with fatal termination in less than twenty-one hours. On preparation of this pus, no microbes were to be observed.

From another vaccinated rabbit, which had resisted several virulent inoculations, the pus injected in the auricular vein of a new rabbit caused death in twenty-nine hours and twenty minutes. This pus had been withdrawn seventeen days after inoculation of the vaccinated rabbit with toxic blood. While the pus formed at the point of inoculation proved so virulent, the serum of the same vaccinated rabbit manifested a very marked preventive property. One cubic centimeter of a very rich culture in this serum, injected in the vein of a rabbit, produced its death only after seventy-eight hours, notwithstanding the enormous difference between the immense quantity of microbes contained in an abundant culture and the few that this pus contained,—so few in number that they were not revealed with the microscope.

We see, according to these experiments, that the *pus which has been formed at the spot where the animal was attacked by the microbe, does not at all possess the preventive property which is so remarkable in the serum of the same vaccinated animals.*

In cases where the organism contains microbes which during a long time remain alive and preserve their virulence, and where, notwithstanding this, the organism is not invaded, we are always tempted to admit the existence of the antitoxic power. The microbe, though virulent, does not hinder, because its toxines are destroyed at the moment of their production. The absence of an antitoxic property from the blood serum, demonstrated in the second chapter, could not furnish sufficient evidence, because we know that often the phenomena which occur in the living organism are very different from those observed in the serum obtained outside of the organism.

Let us examine the behavior of vaccinated rabbits with regard to the toxines. This question has already been approached by Mr. Selander, who arrived at the conclusion that "immunity against the microbe may be acquired without immunity against the toxines being established." This result has been established by the fact that the rabbits, while vaccinated against the very virulent virus, die when they receive minimum doses of toxic blood. Of the three vaccinated rabbits poisoned by Mr. Selander, one suffered with toxic injection eighteen days after testing with the mortal virus; a second, nineteen, and a third, twenty-seven days after the test. These rabbits had regained their natural weight, appeared in good health, and yet they all died under the same conditions, and at the same time as the witnesses. Mr. Selander was kind enough to let me witness this experiment, the exactitude of which I can confirm.

Though the fact of the sensitiveness of the vaccinated rabbits to the toxines had already been observed by Mr. Selander I have sought to ascertain them by my own experiments. To that end I injected minimum mortal doses of toxic blood in the veins of three vaccinated rabbits. Intoxication was practiced twenty-one, sixty-two, and one hundred and nine days, after the date of the last test with the virulent virus. The first rabbit, tested four times with the living virus, had become visibly impoverished; but the other two rabbits were completely recovered from the inoculation and considerably increased in weight. Well, the three rabbits manifested a great deal of susceptibility to the toxic blood, and died before their non-vaccinated witnesses. *The toxines injected in the blood of vaccinated rabbits had consequently not been neutralized, nor had they destroyed their structure.*

The vaccinated rabbits are equally sensitive to the doses of the non-fatal toxines. Injected in the auricular veins, these doses provoke a general uneasiness and an elevation of temperature, as in the witnesses not vaccinated. Even the toxic blood heated to 60° C. produces the same effect on the rabbits refractory to the living virus and on the witnesses.

The toxines injected under the skin act in the same manner on vaccinated rabbits and other witnesses.

This accumulation of facts demonstrated that the acquired *immunity against hog cholera is not at all due to an antitoxic property of the vaccinated organism.*

The resistance of the vaccinated rabbits which have some virulent microbes in their phagocytes, is not truly due to the antitoxic power of their bodies.

As there is no destruction of toxines in the organism of vaccinated rabbits, they rid themselves of the toxic substances by the aid of exaggerated diuresis. The difficulties that we encounter in securing pure urines in sufficient quantities to study in precise manner their toxic power, are such that I have contented myself at this stage with examining the quantity of urine emitted.

In the course of a slow or acute disease, there is no retention of urine, and it is only in exceptional cases that we find the bladder full at autopsies. The quantity of urine emitted demonstrates, rather, the augmentation of *diuresis* during hog cholera in the rabbits.

I have made a comparative observation on two rabbits, inoculated under the skin with virulent virus, one of which was vaccinated and the other was utilized as a witness. It is in the last that the greatest quantity of urine was passed, both before the inoculation of the virus and during the disease.

There is only one conclusion to draw from these experiments, and that is that the inoculation is not connected with the retention of urine in the rabbits.

Of all the differences which may have been found between the vaccinated rabbits and the witnesses, the most considerable is undoubtedly that which concerns the system of phagocytary defense.

When we inoculate a very virulent mortal virus in the rabbit not vaccinated in the subcutaneous tissue, a hyperemia of all the neighboring vessels is produced, the diapedesis is feeble, and phagocytosis rare. At the point of inoculation there appears a slight soft tumor. In the vaccinated, the tumor is, on the contrary, hard and larger: the diapedesis is considerable and phagocytosis extremely developed.

When the inoculated virus is less active, a progressive tumor is produced in the non-vaccinated rabbits, which also contains a quantity of leucocytes. In case of cure, there is developed at the point of inoculation, a thick pus, formed by the masses of leucocytes.

Mr. Massart has observed that virulent virus of hog cholera contained in glass tubes, and introduced into the abdominal cavity of the rabbits, produces only a feeble attraction for leucocytes, but in the vaccinated rabbits, on the contrary, attracts them very strongly.

There exists then, a parallelism manifest between the resistance of the animal and the activity of the phagocytes.

The subcutaneous injection of toxic blood heated to 58° or 60° C., provokes equally a leucocytory reaction, very different in the vaccinated rabbits and witnesses. While in the former the tumor contains masses of migrated leucocytes produced from the beginning, in the latter the tumor is soft, and contains only a few leucocytes. It is only later, when the witness rabbit enters the stage of cure, that the number of leucocytes augment, and the tumor becomes firmer.

These facts are in perfect accord with the phenomena of the leucocytes in rabbits infected by the microbe, but intoxicated by the toxine of hog cholera. In vaccinated rabbits, the number of leucocytes is materially augmented, while in the witnesses it diminishes in a notable way. Mr. Werigo observed the latter fact for the first time in investigations executed in my laboratory, and he will speak on the subject in his writings.

We see, then, from all that precedes in this chapter, that in the resistance of vaccinated rabbits against hog cholera, the phagocytes which direct themselves toward the microbes, which englobe them in a living and virulent state, and which end in destroying them in their protoplasma, exert a function of the highest importance. This role is the more considerable because the phagocytes are not seconded by any property whatever capable of destroying the toxic products of the microbes of hog cholera.

(To be continued.)

THE NEW CHEMISTRY OF THE STOMACH.

BY J. H. KELLOGG, M. D.

(Continued.)

As the work upon which this paper is based includes, so far as the writer knows, the largest number of cases which have been studied by so exact methods of investigation, I think it important to present a brief summary of the results obtained, which will show at a glance the relative frequency of the pathological conditions which are recognized by this mode of investigation, and as will appear, indicate that some of the current notions upon this subject are quite erroneous. With reference to the three general classes, hyperpepsia, hypopepsia, and simple dyspepsia, the cases were divided as follows : —

Hyperpepsia.....	170
Hypopepsia.....	116
Simple dyspepsia.....	35

In considering these figures, it should be remembered that hyperpepsia and hyperacidity are by no means coincident conditions ; and that each of the three groups included in hyperpepsia has a sub-group in which the acidity is below normal. The old method of analysis would place all of these cases in hypopepsia ; but as the cases given show, and as will appear still more clearly from the summary of the particular conditions observed for each group, many cases of hypoacidity are really cases in which there is an excess of stomach work rather than a deficiency, and hence belong to the class of hyperpepsia rather than hypopepsia.

The accompanying tables present at a glance the particular facts observed as regards the relative frequency of excess, deficiency, and equality, in the figures found by analysis in relation to the total acidity (T), the coefficient of digestive work (*a*), the total chlorine (T), the free HCl (H), the combined chlorine (C), and the sum of free HCl and combined chlorine (H+C), representing the amount of chlorine set free from the bases and prepared to enter into the work of digestion.

The tables also show the relative frequency of the different forms of hyperpepsia, hypopesia, and simple dyspepsia, and the dominant characteristics of each group. The following facts presented by the tables are especially worthy of note : —

Hyperpepsia.— The 170 cases found in this class constitute 52.9% of the total number of cases studied.

1. *Hyperpepsia with Hyperhydrochlorie* (*H*+).— The first group of this class, hyperpepsia, with hyperhydrochlorie, or free HCl in excess, presents sixty-three cases, which is 19.6% of the entire number of cases studied, or 37 % of all the cases of hyperpepsia. This is by far the largest single group found. In this group, A is of course nearly always +, yet we find A — in six cases, although, as will be noticed, free HCl (H), and combined chlorine (C), are + in all the cases of this group. It is evident, then, that these six cases could not be properly classed as cases of hypopepsia, although in a single one of them the total chlorine (T) was slightly deficient. The total chlorine is found in excess in 50 of the 54 cases.

An interesting fact especially worthy of note in relation to this group is the frequency with which *a*— occurs. Since the figures represented by *a* are an index to the quality of the digestive work done, or, at any rate, to the chemical quality of C, indicating, when deficient, the presence of neutral chloro-organic compounds, which are as much greater in proportion as *a* is less than normal, it is evident that in this group of hyperpepsia, in which we find both H+ and C+ and with rare exceptions A+ and T+, or hyperacidity and excessive secretion of chlorine, the digestive product is, if not in the majority of cases, in at least a large minority (42.8%), inferior in quality, a fact which accounts for the remark often made by this class of patients, " Doctor, I have a ravenous appetite ; I eat more than I ought to eat, and I seem to digest my food without difficulty ; nevertheless, I lose in weight continually, and cannot gain an ounce of flesh."

2. *Hyperpepsia with Hypohydrochlorie* (*H*—).— In this group, characterized by a deficiency of free HCl, we find seventy-four cases, 23% of the total number of cases studied, or 43.5% of the cases of hyperpepsia. This group is only exceeded by the preceding in the number of cases which it presents.

TABLE I.—SUMMARY OF THE RESULTS OF CHEMICAL ANALYSIS OF STOMACH FLUID IN 321 CASES OF DISORDERED DIGESTION, CLASSIFIED IN RELATION TO NORMAL QUANTITIES.

Cases.	Group.	Sub-Group.	No. Cases.	Coefficient (*a*)				Total Cl (T)			Free HCl (H)				Combined Cl (C)				(H+C)		
				+	=	—	0	+	=	—	+	=	—	0	+	=	—	0	+	=	—
Hyperpepsia, 170 cases.	Hyperhydrochlorie (H+) 63 cases	Hyperacidity (A+) without a. f.	29	..	6	23	..	27	2	..	29	..	..	..	29	..	..	..	29	..	..
		" with a. f.	29	29	..	..	..	29	..	..	29	..	..	..	29	..	..	..	29	..	..
		Hypoacidity (A—) without a. f.	5	..	..	5	..	4	1	..	5	..	..	..	5	..	..	..	5	..	..
	Hypohydrochlorie (H—) 74 cases.	Hyperacidity (A+) without a. f.	29	..	7	22	..	11	12	6	..	..	29	..	29	..	..	..	29	..	..
		" with a. f.	37	37	..	..	..	19	13	5	..	..	37	..	37	..	..	..	37	..	..
		Hypoacidity (A—) without a. f.	8	..	..	8	..	3	5	..	..	..	8	..	8	..	..	..	7	1	..
	Hypochlorhydrie (C—) Useful Work Deficient. 33 cases.	Hyperacidity (A+) without a. f.	1	..	..	1	..	1	..	..	1	..	..	..	..	..	1	..	1	..	..
		" with a. f.	9	9	..	..	..	8	1	..	9	..	..	..	..	..	9	..	3	6	..
		Hypoacidity (A—) without a. f.	12	..	..	12	..	8	2	2	12	..	..	..	..	..	12	..	1	5	6
		" with a f.	8	8	..	..	..	7	1	..	8	..	..	..	..	..	8	..	1	3	4
		Pseudo-hyperacidity (A+A'—) with a f.	3	3	..	..	..	2		1	3	.	..	..	..	..	3	..	..	1	2
Hypopepsia, 117 cases.	1st Degree. (A— but above .100 gms.) 58 cases.	Hypoacidity (A—) without a. f.	29	..	..	29	..	2	3	24	..	2	24	3	10	6	13	..	..	8	21
		" with a. f.	18	18	..	..	..	3	6	9	..	4	13	1	1	7	10	..	..	1	17
		Pseudo-hyperacidity (A+A—) with a. f.	11	11	..	..	..	3	2	6	..	4	7	...	1	3	7	..	..	4	7
	2d Degree. (A— and below .100 gms). 57 cases.	Hypoacidity (A—) without a. f.	35	..	..	32	3	1	1	33	..	3	28	4	..	..	34	1	..	..	35
		" with a. f.	19	19	..	..	..	2	4	13	..	4	12	3	..	..	18	1	..	..	19
		Pseudo-hyperacidity (A+A—) with a. f.	3	3	..	..	..	..	1	2	..	2	1	..	..	..	3	..	..	..	3
	3d Degree—Apepsia (A0). 2 Cases.	Neutral (A0)	2	..	..	..	2	..	..	2	..	..	..	2	..	..	2	..	..	..	2
Simple Dyspepsia, 34 cases.	Without Fermentation. 19 cases.	Typical (a=)	5	..	5	..	..	1	3	1	1	2	2	..	5	..	..	..	4	1	..
		Qualitative (a—)	14	..	..	14	..	1	7	6	..	8	6	..	10	4	..	..	6	7	1
	With Fermentation. 15 cases.	Hyperchlorhydrie (C+)	14	14	..	..	..	4	4	6	..	9	5	..	10	4	..	..	5	9	..
		Hypochlorhydrie (C—)	1	1	..	..	..	..	1	..	..	1	..	..	.	..	1	..	..	1	..

TABLE II.—GENERAL SUMMARY OF THE RESULTS OF CHEMICAL ANALYSIS OF STOMACH FLUIDS IN 321 CASES, CLASSIFIED IN RELATION TO NORMAL QUANTITIES.

Class.	Group.	No. Cases	Acidity (A)				Coefficient (*a*)				Total Cl (T)			Free HCl (H)				Combined Cl (C)				(H+C)		
			+	=	—	0	+	=	—	0	+	=	—	+	=	—	0	+	=	—	0	+	=	—
Hyperpepsia 170 Cases.	Hyperhydrochlorie (H+)	63	58	..	5	..	29	6	28	..	60	3	...	63	...	...	..	63	...	...	..	63	..	...
	Hypohydrochlorie (H—)	74	66	..	8	..	37	7	30	..	33	30	11	...	...	74	..	74	...	...	..	73	15	...
	Hypochlorhydrie (C—)	33	13	..	20	..	20	..	13	..	26	4	3	33	...	...	..	...	...	33	..	6	1	12
	Total	170	137	..	33	..	86	13	71	..	119	37	14	96	...	74	..	137	...	33	..	142	16	12
Hypopepsia 117 Cases.	1st Degree (A—, but above .100 gms.)	58	11	..	47	..	29	..	29	..	8	11	39	...	10	44	4	12	16	30	..	...	13	45
	2d Degree (A— and below .100 gms)	57	3	..	54	..	22	..	32	3	3	6	48	...	9	41	7	...	...	55	2	...	..	57
	3d Degree — Apepsia (A 0)	2	...	..	...	2	...	..	...	2	...	...	2	...	...	...	2	...	...	2	..	...	..	2
	Total	117	14	..	101	2	51	..	61	5	11	17	89	...	19	85	13	12	16	87	2	...	13	104
Simple Dyspepsia 34 Cases.	Without Acid Fermentation	19	4	8	7	..	...	5	14	..	2	10	7	1	10	8	..	15	4	...	..	10	8	1
	With Acid Fermentation	15	5	9	1	..	15	..	...	..	4	5	6	...	10	5	..	10	4	1	..	5	10	...
	Total	34	9	17	8	..	15	5	14	..	6	15	13	1	20	13	..	25	8	1	..	15	18	1
	Grand Total	321	160	17	142	2	152	18	146	5	136	69	116	97	39	172	13	174	24	121	2	157	47	117

It is noticeable that the total chlorine is in excess much less frequently in this group (44.6%), as compared with the preceding (95.2%). The less frequency with which hyperacidity occurs in this group, and the smaller proportion of cases in which the total chlorine is in excess, indicate distinctly that in this group the hyperpepsia is less pronounced than in the preceding. A careful study of the cases in this and the preceding group show a gradually descending scale reaching from the most pronounced hyperpepsia down to hopopepsia. The most attenuated cases, in fact, seem to overlap the first group of hypopepsia, so that the fourth division of hyperpepsia with hypohydrochlorie (H — A′ —, + a. f.) would coincide with the first division of hypopepsia of the first degree.

Hyperacidity is the dominant condition as in the preceding class, although likewise not absolutely constant; for we find A — in four cases, notwithstanding that the amount of combined chlorine is present in so great excess as to more than compensate for the deficiency of free HCl in every case, so that we find in all the cases of this group (H + C) in excess. Evidently there is a sufficient amount of chlorine set free from the bases to give a figure for A in excess of the normal in every case. The hypoacidity is then due in these cases to the presence of neutral chloro-organic compounds, shown by the diminution of *a*. It will be noted, however, that A — occurs less frequently in this group (6.7%), than in the preceding (7.9%). The same is true of *a* —.

3. *Hyperpepsia with Hypochlorhydrie or Combined Chlorine.* — The value of the method of chemical investigation of stomach fluids, to which it is the purpose of this paper to call attention, is especially apparent in the study of this group of cases of hyperpepsia. In fact it is only by the aid of this method that it is possible to discover these cases, and form of them a distinct group. The older methods give their characteristic reactions in the presence of both free HCl and combined chlorine, and hence afford no means of distinguishing between these two important conditions of the chlorine participating in the digestive act: and yet a recognition of these conditions and a careful determination of the quantity of chlorine in each state in a given case, affords our only means of determining how much of the chlorine set free from the bases with which it is combined when secreted by the stomach, really enters into the digestive process by combining with albumen for the conversion of the latter into peptone.

The 33 cases comprised in this group constitute 10.2% of the entire number of cases studied, or 19.4% of the cases of hyperpepsia. It will be noted that A — occurs in nearly two thirds of the entire number of cases, showing at once the fact that the combined chlorine (C) is a more important element in the production of the normal acidity of the gastric juice than is free HCl (H).

The total chlorine is in excess in 78.9% of the cases, a much larger proportion than in the preceding group. Free HCl is in excess in all the cases, although the total amount of chlorine set free, shown by the sum of H and C (H + C) is deficient in 36.3% of the total number of cases, being in excess in only six cases, or less than one fifth of the entire number of cases in this group.

The quality of the digestive product is also poor, however, in a large proportion of cases, as shown by the low value of (*a*), which is below normal in thirteen cases, or 39.4% of the total number, and also by the absence of peptones from the stomach fluid.

This class, notwithstanding the large proportion of cases of hypoacidity (60.6%), is evidently allied to the preceding groups, although the general formula furnished by the cases of this group with hypoacidity is also very closely allied to the formula found in the first group of hypopepsia. One characteristic peculiarity alone distinguishes the formulæ of this group from those of hypopepsia of the first degree; namely, the excess of free HCl, or H +, which is always present in this group, associated with C —, but is never found in hypopepsia. It will also be noticed that in all the sub-groups of this class of hyperpepsia, T + (total chlorine in excess) takes the precedence, T = and T — only occurring in the third and fifth subdivisions of the group, its most attenuated forms, which approach very closely to hypopepsia, as does the third form in each of the preceding groups.

Both the groups may be said to touch the line of hypopepsia, which is

actually overlapped by the preceding group, as already remarked.

4. In the total summary of the characteristics exhibited by hyperpepsia in its different forms, we find A + in 80.6% of the cases of hyperpepsia; A — in a little less than one fifth of the cases, while A = is absent. It should be mentioned, however, that A + includes a few cases in which the total acidity was close to the extreme upper limit of normal variation, and A — two or three cases in which A was close to the lower limit. A = is a characteristic of simple dyspepsia.

The coefficient *a* is below normal in 71 (41.7%) of the cases. *a* = occurs in only 13 cases, being one of the characteristics of simple dyspepsia. The total chlorine is equal, or in excess, in 119 cases (70%), being found deficient in only 14 (8.2%) of the cases.

H + occurs in 96 (56.5%) of the cases, and H — in 74 (43.5%) of the cases. We find C (combined chlorine) in excess in 137 (80.5%) of the cases, and deficient in 33 (19.4%) of the cases. (H + C) is in excess in 142 (83.5%) of the cases, equal in 16 (9.4%) of the cases, and deficient in 12 (7%) of the cases.

Hypopepsia. — The total number of cases of hypopepsia was found to be 117, 36.4% of all the cases examined, a much smaller number than would be supposed by the frequency with which hydrochloric acid is administered to patients by physicians and the great quantities of pepsin and other digestive agents, and digested or partially digested food substances annually swallowed by dyspeptics. A careful study of the chemistry of digestion in pathological cases shows that deficient digestive work is not the chief fault in the majority of cases of disordered digesgestion, but abnormal or vicious chemical work. My statistics show unmistakably that in a great proportion of cases of indigestion, the stomach is even doing an excess of work; but the quality of the work done is inferior or takes a wrong direction, so that notwithstanding the great amount of labor performed by the stomach, the blood is not supplied with the proper amount of well-elaborated food substances, but instead receives a great amount of material which has been partially digested only, or has been subjected to deteriorating changes through the action of microbes and other ferments, and which must be destroyed by the liver and eliminated by the kidneys and other emunctories, along with the normal waste and excrementitious products of the tissues. It is this semi-starvation and auto-intoxication which gives rise to a great share of the morbid symptoms presented in various forms of functional stomach disorder.

In hypopepsia we find a still greater deficiency of well elaborated food elements than in hyperpepsia, and yet it is not uncommon to find persons suffering from a very extreme degree of hypopepsia who are not by any means so much emaciated as we should expect to find them, and sometimes even enjoying fair health, owing to the fact that the stomach is not the chief digestive organ of the body, but only a sort of antechamber in which the preliminary digestive work is done. So it is possible for very good health to be enjoyed coincident with hypopepsia, provided a suitable dietetic regimen is followed, and even though the stomach may be almost wholly inactive in the digestive process.

As before stated, I have followed the plan of Hayem and Winter in grouping cases of hypopepsia, since their method, although wholly artificial, is as good as any that has occurred to me. The study of a still larger number of cases will perhaps enable me to find a natural and better basis of classification.

1. *Hypopepsia of the First Degree (A — or A' —, but above .100 gms.).* — The total number of cases in this class is 58 or 49.4% of all the cases of hypopepsia. We find here, as in hyperpepsia, a few deceptive cases, although of the opposite character. The total acidity which is usually less than normal (47 cases, 81.1%) was found to be in excess in 11 cases (18.9%). As hydrochloric acid was also present in all but three of the cases, although diminished in quantity, these cases examined by the older methods would have been pronounced cases of hyperpepsia; but that they belong to the class of hypopepsia is evidenced by the fact of the deficiency in the total chlorine (T), and also in the diminished combined value of H and C (H + C), as well as the low value of H. These cases afford another interesting illustration of the importance and value of the ingenious method of investigating stomach fluids

devised and perfected by Hayem and Winter.

A — appears in 47 (81%) of the cases, much more frequently than in hyperpepsia.

The total chlorine is in excess in but eight cases (13.8%), being deficient in 39 (67.2%) of the cases. Free HCl (H) was deficient in 44 (75.8%) of the cases, and entirely absent in four cases (6.8%). A few cases in which it was found equal were classified as hypopepsia because of the low values of T and C, showing an evident and marked diminution in both the secreting and chemical work of the stomach. The combined chlorine (C) was deficient in 30 (51.7%) of the cases, equal in 16 (27.6%), and in excess in 12 (20.7%); and (H + C) was minus in 45 (77.6%) and equal in 13 (22.4) of the cases, never in excess.

2. *Hypopepsia of the Second Degree* (*A or A′ —, and below .100 gms.*).— Total number of cases, 57, or 48.5% of the cases of hypopepsia. Here, as in the preceding group, we find a few cases (three, or 5.2%) of pseudo-hyperacidity. In each of these cases, as in the similar cases of the preceding group, an abnormal degree of acidity was present, due to acid fermentation and the formation of a great quantity of lactic acid and perhaps other members of the fatty acid series. That these cases belong properly to the class hypopepsia, is easily ascertained by obtaining the value of A′ by the method previously described. This value was, in the three cases of hyperacidity found in this group, determined to be less than .100 gms., although the acidity was in one instance found to be .413 gms., or more than double the normal amount, the value of A′ in this instance being only .86 or about one fifth the total acidity.

In this case we find A less than normal in 54 (94.7%) of the cases, a much larger proportion than in the preceding group. T + occurs in this group in but three cases, the total chlorine falling below normal in 48 (84.2%) of the cases and equal in only six (10.5%). The free hydrochloric acid was normal in only nine (15.8%) of the cases, below normal in 41 (71.9%) of the cases, and o in seven cases. C was o in two cases, and below normal in 55 (96.5%) of the cases. The advanced state of hypopepsia in this group is shown by the fact that the combined value of H and C (H + C) is below normal in every case, while in the preceding group this value is normal in 22.4% of the cases.

3. *Hypopepsia of the Third Degree* (*A o, or Apepsia*).— In the two cases of this sort which I have met, A and *a* were minus in both. In one of these cases the reaction of the stomach fluid was slightly alkaline, and the value of A — was .20. T was minus in both cases. Free HCl was wholly absent in one case, and present in a small quantity in the other. Combined chlorine (C) was present in slight quantity in both cases.

In this group, the stomach work reaches the vanishing point, a condition which not infrequently co-exists with malignant disease, although not invariably present. When present in connection with a perceptible thickening in the epigastric region, it becomes, however, a very important aid to diagnosis, as hyperpepsia would not be likely to co-exist with such a condition except in the case of gastric ulcer accompanied by fibrous thickening. We thus have a very important means of differential diagnosis in a class of cases in which it is sometimes difficult to determine by other means whether an existing disease of the stomach is simple ulceration which may be cured, or a disease of a malignant and incurable character.

Summarized, the facts relating to hypopepsia are as follows: A — in 101 (86.3%) of the cases; A + in only 14 (11.9%); total chlorine in excess (T +) in only 11 (9.4%) of the cases, and deficient in 89 (76%) of the cases. Free HCl was found deficient in 85 (72.6%) of the cases, and normal in only 19 (16.2%). Free HCl was entirely absent in 13 (11.1%) of the cases. The combined chlorine was diminished in 87 (74.3%) of the cases, equal in 16 (13.6%), and in slight excess in only 12 (10.2%) of the cases. The combined value of free HCl and combined chlorine was also deficient in 104 (88.8%) of the cases, and equal in only 13 (11.1%).

Simple Dyspepsia.— This class includes 34 cases, 10.6% of the entire number studied. The cases included in this class are those in which there was no serious disturbance of the chemical work of digestion. The smallness of the proportion of cases is at once an indication of the importance of a careful chemical

study of the stomach fluid in all cases of dyspepsia, to obtain a basis for a rational plan of treatment.

Of the cases of simple dyspepsia the total acidity (A) was found to be in slight excess in nine (26.4%) of the cases, equal in 17 (50%), and slightly deficient in only eight (23.5%) of the cases. The coefficient *a* was found in excess in 15 (44.1%) of the cases, as the result of acid fermentation, which is the principal chemical disturbance met with in simple dyspepsia, there being neither a deficiency nor an excess of chemical work of any considerable degree, but rather a vicious chemical action added to the normal work of the stomach. That this vicious action may ultimately lead to a disturbance of the normal chemical work of the stomach, I have many times seen demonstrated by the readiness with which the normal chemical work of the stomach is resumed when acid fermentation is suppressed by lavage and the employment of intestinal antisepsis through the aid of proper diet, and when necessary, antiseptic medication.

We find *a*— in 14 (41.1%) of the cases, and evidence that a deterioration in the quality of the work done by the stomach may occur without either an increase or a diminution of the amount of work done; in other words, without either hyperpepsia or hypopepsia. T= was found in 15 (44.1%), T+ in 6 (17.6%), T— in 13 (38.2%) of the cases. Free HCl was normal in quantity in 20 (58.8%), and deficient in 13 (38.2%) of the cases. Combined chlorine (C) was in excess in 25 (73.5%) of the cases. This deviation is not sufficiently serious in itself to characterize the case as abnormal, since an increase of combined chlorine is, according to my observation, a condition commonly present in cases in which a patient is rapidly gaining in flesh. The combined value of H and C (H + C) was slightly in excess or equal in nearly all the cases (33, or 97%).

General Summary.— A brief glance at the grand total of the chemical facts contained in the table shows hyperacidity to be present in 170 (52.9%) of the cases; hypoacidity was found in 117 (36.4%) of the cases. The acidity was normal or equal, in 17 (5.3%) of the cases, and wholly absent in two (.6%) of the cases.

The coefficient of chemical stomach work, shown by the value of *a*, was in excess in 152 (47.3%) of the cases, deficient in 146 (45.4%) of the cases, equal in 18 (5.6%) of the cases, and 0 in five cases.

The total chlorine was in excess in 136 (42.3%) of the cases, deficient in 116 (36.1%) and equal in 69 (21.4%) of the cases.

Free HCl was in excess in 97 (30.2%), deficient in 169 (52.6%), equal in 12% of the cases, and entirely absent in 13 (4%) of the cases. Combined chlorine (C) in excess in 174 (54.1%), deficient in 121 (37.6%) cases, equal in 24 (7.4%) cases, and totally absent in two cases. The combined value of H and C (H + C) appeared in excess in 157 cases (48.9%), deficient in 117 (36.4%) cases, and equal in 47 (14.6%) cases.

Acid Fermentation.—It is interesting to note the relation of acid fermentation to the several classes described. As indicated by the value of *a*, fermentation was present in 87 (51.1%) of the cases of hyperpepsia, in 51 (43.5%) of the cases of hypopepsia, and 15 (44.1%) of the cases of simple dyspepsia; from which it appears that acid dyspepsia is a more frequent accompaniment of hyperpepsia than of hypopepsia. This fact would seem at first sight to oppose the opinion generally held that the free HCl of the gastric juice is a natural antiseptic, and of great use in inhibiting abnormal fermentations. It seems probable, however, that in many cases, the hyperpepsia may be the result of glandular irritation and hyperactivity produced by the contact with the gastric membrane of lactic and other acids produced in excess by abnormal fermentations. That free hydrochloric acid lessens the tendency to acid fermentation in the stomach is clearly shown by a comparison of the frequency of the occurrence of fermentation in the different groups of hyperpepsia. In the first group, hyperpepsia with hyperhydrochlorie, acid fermentation was found in 29 cases (46%); in the second group, free hydrochloric acid was deficient, although (H + C) was in excess, and acid fermentation was found present in 37 cases (50%); while in the third group, hyperpepsia with hypochlorhydrie, acid fermentation was found present in 20 cases (60.6%).

Just why acid fermentation occurs less frequently in hypopepsia than in hyper-

pepsia, is somewhat difficult to understand. A remarkable concurrent fact, and one which I believe is new to the study of this subject, is the very complete digestion of starch in cases of pronounced hypopepsia, which I have observed in a very considerable number of cases. In fact, I have found the state of the starch digestion to be a very good index to the degree of total acidity. When A is large, Lugol's solution gives a blue, bluish purple, or purple color, showing that the starch is unchanged or is partially or completely converted into erythro-dextrine. In well-marked cases of hypopepsia with hypoacidity, Lugol's solution gives no reaction whatever, showing complete conversion of the starch into sugar, an observation which is confirmed by the strong reaction for sugar given by Fehling's solution.

Through the more prompt conversion of starch into sugar in the stomach in hypopepsia, the digested starch may disappear by absorption so rapidly that the conditions become less favorable for the development of acid fermentation than in the presence of a large quantity of partially digested starch. This point is of sufficient interest to be worthy of more complete study, and I hope to be able to elucidate it more fully in some future paper.

(To be Continued.)

CONTRIBUTION TO THE STUDY OF PROGRESSIVE MUSCULAR ATROPHY.

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DURING several years back there have come under my observation a large number of cases of the above named disease. The following paper is based largely on a personal study and treatment of these cases, as seen in hospitals and institutions especially adapted to the treatment of similar diseases. I hardly deem it profitable in this connection to enter into the history of the disease or the theories and teachings of the older investigators, many of which have no value to us, except as a matter of history, in the development of our present knowledge of the subject.

The many improved methods of study and investigation, especially the very satisfactory methods of staining nervous tissue, which science has recently placed in our hands, have cleared away many of the uncertain theories of the older pathologists, and established our knowledge on a more sure foundation. But while taking a brief retrospective view of the development of the knowledge of the subject under consideration, and congratulating science for the advancement she has made in a better understanding of this particular disease, we are still far from the goal of complete and perfect knowledge and absolute control.

Causes.— Heredity undoubtedly has some influence in the causation of this disease; not that we frequently see a transmission from parent to offspring of this particular malady, but of a peculiar neuropathic condition, which makes the individual peculiarly susceptible to other more active causes which may be sufficient to develop the disease. Frequently there is in the families of these cases, epilepsy, pulmonary consumption, and other chronic diseases, indicative of a neuropathic state. Rarely is there a direct inheritance of this disease. Gowers reports two cases of this kind. Males are more susceptible to the disease than females. According to Friedreich's statistics, females constitute only eighteen per cent of the whole number of cases. The per cent of cases in females coming under my own observation has been even smaller than this. It is doubtful if this large difference is due simply to sex. It is more reasonable to ascribe the larger per cent in males to their greater exposure to noxious influences.

Progressive muscular atrophy most frequently manifests itself between the ages of thirty and fifty years. Rarely does the disease find its victims outside of these limits. Most of the cases coming under my observation have been above forty-five years of age. I have seen the disease well advanced in one case at twenty years, but it is probable that most cases of muscular atrophy occurring in early life are due to inflammatory and not to degenerative processes of the spinal cord, or else are idiopathic in their nature.

Among the more direct and exciting causes may be mentioned syphilis, exposure to wet and cold, excessive venery, injuries, mental distress and anxiety, and

possibly excessive use of certain muscles. In those cases which succeed syphilis, an interval of several years usually intervenes between the primary disease and the degenerative changes in the nervous system. A large number of cases coming under my observation have been subjects of exposure to wet and cold. A goodly number of these have been traveling men, and men engaged in railroad service. So large has been the percentage of this class that it has suggested to me that possibly railroad traveling itself, continued for a long time, may act as a factor in producing some disturbance in the nutrition of the spinal cord, which ultimately might result in this disease. Traveling men and men in railroad service are frequently exposed to the inclemency of the atmosphere, and it may be that this and other causes, which we may be unable to elicit in the history of the case, are also active factors. In one case the disease developed after a single exposure by bathing late in the fall of the year, when the water was extremely cold. More frequently several exposures are necessary to develop the disease. Frequently the deleterious effects of the exposure first manifest themselves by neuralgic pains, to be followed later on by the more serious and more permanent symptoms which characterize the disease. By some authorities, mental distress, especially fright, is said to be one of the most frequent causes. It is a well-established fact that the mental state has a wonderful influence upon the nutritive processes of the body, and it may be possible that this condition, long continued, together with some other cause or causes, may be sufficient to establish the disease.

The disease finds its victims in all classes of society, quite as large a per cent of the cases coming under my observation having been among the rich and middle classes as among the poor, and those whose circumstances in life have been less favorable.

The disease is frequently seen among those whose occupation demands an excessive use of certain muscles of the body. It is true that an excessive use of muscles may cause them to atrophy; but it is quite doubtful if excessive exercise of any particular set of muscles is sufficient to bring about a disease so wide in extent and so extreme in degree as that of progressive muscular atrophy. More often the cause in these cases will be found elsewhere.

There are certain well-marked diseases of the nervous system which seem at times to follow injuries in some part of the body. Very frequently the disease makes its onset at the seat of the injury. Paralysis agitans, locomotor ataxia, and progressive muscular atrophy are examples of these. Frequently cases present themselves in which no apparent cause can be found. Again, two or more of the causes mentioned above may be active in any given case. Sometimes there is a weakness and wasting of certain muscles following an infectious disease, as measles, typhoid fever, or diphtheria, but the cause of the atrophy of the muscles in these cases is usually a neuritis, and is not due to any disease of the spinal cord.

Symptoms. — The symptoms of this disease are confined almost entirely to the motor system. The weakness and wasting of the muscles are so distinctly prominent and so universally present as to be characteristic of the disease. The weakness and atrophy usually occur simultaneously; sometimes, however, there is a weakness before any wasting is noticed. Very soon, the wasting shows itself in the muscles first paralyzed. The disease usually begins in the muscles of the upper extremities, manifesting itself with about equal frequency in the muscles of the shoulder and the smaller muscles of the hand. When the disease begins in the muscles of the hand, the attention of the patient is frequently directed to the weakness by the difficulty experienced in performing some delicate movement, such as writing or buttoning the clothing. This weakness is usually soon accompanied by a wasting of the parts affected. In the hand, the thenar and interossei muscles are usually the first to be affected, and their wasting, together with contraction of the long flexors and extensors, causes a peculiar appearance of the hand (the "claw-like hand"). The thenar eminence is flattened, sometimes depressed, or in an advanced stage of the disease there may be an entire absence of muscular tissue, so that the first metacarpal bone can be distinctly felt beneath the skin. The skin over the formerly rounded eminence, on account of the wasting of the muscles beneath, becomes relaxed, wrinkled, and superfluous. On account of the wasting of the interossei

and lumbricales, depressions form between the metacarpal bones on the back of the hand, and the flexor tendons in front. (See Fig. 1, frontispiece.)

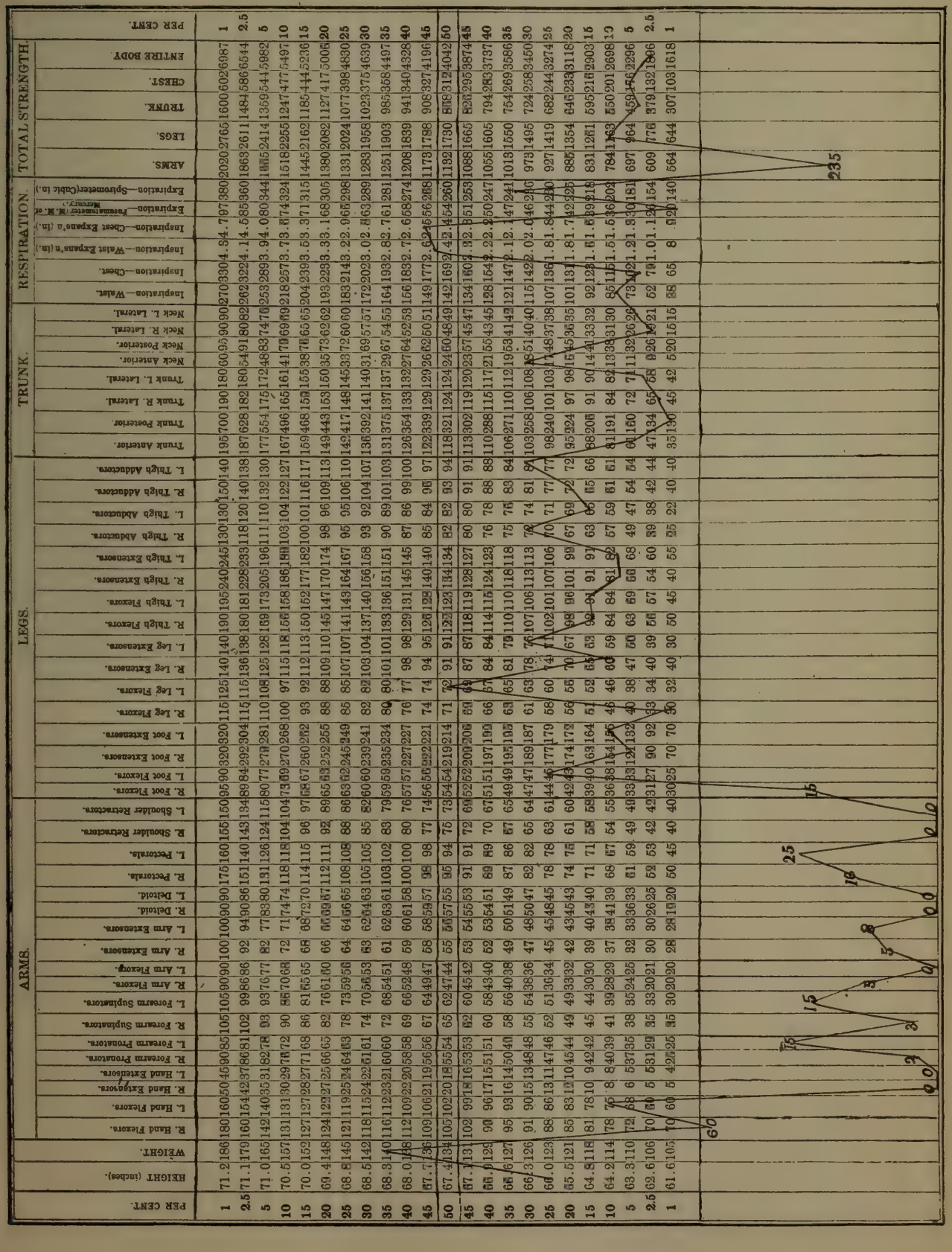
From the hand the disease may next attack the muscles of the forearm, particularly the extensors; or the muscles of the shoulder on the same side may be next affected, while the muscles of the forearm and arm remain intact until later in the history of the disease, or may escape entirely. Sooner or later the disease shows itself in the corresponding muscles of the hand of the opposite side of the body, and here again affects in turn the muscles of the shoulder, arm, and back, and may then travel downward and affect the muscles of the lower limb. When the disease begins in the shoulder, the deltoid usually suffers first, and frequently with it the supra and infra-spinati are involved. (See Fig. 2, frontispiece.) These three muscles have to do with raising the arm and rotating it outward. When they are the seat of paralysis, the movements which they are accustomed to perform in health are either diminished or absent. In such a case we find the patient unable to raise the arm to a horizontal position (principally from paralysis of the deltoid), and the arm is usually carried with the palmar surface looking backward (paralysis of the supra and infra-spinati), instead of facing inward toward the body, as is the case normally. In a very early stage of the disease, this rotating of the arm inward may not be present; but when the spinati are involved to any extent, it is noticeable, and not infrequently if the patient is asked to raise his arm to a horizontal position, it will be noticed that it is done only with great difficulty, or a horizontal plane may not be reached at all, and with the progress of the disease this symptom becomes more and more marked.

From these two above points in the upper extremity, namely, the deltoid muscle of the shoulder and the smaller muscles of the hand, the disease gradually spreads to other adjacent parts, until it is quite universal in its extent and extreme in degree. The trapezius, serratus magnus, latissimus dorsi, and pectoralis major are among the muscles of the shoulder and back that are frequently affected in the earlier stages of the disease. The muscles that extend the head on the spine are frequently affected to such a degree that it is with difficulty that the patient can carry the head in an upright position. To compensate for this loss of power, and to prevent the head from dropping forward upon the chest, it is thrown backward sufficiently to bring its center of gravity directly over the spine and habitually carried in this position. It is not without difficulty that the patient is able to bring the head into this position, but when once gained, the work of the weak muscles at the back of the neck is much lessened. If the head is moved slightly forward, it is apt to drop so that the chin touches the chest, and can only be moved back to its former position with a great effort. In some cases the disease begins in the muscles of the forearm, usually the extensors, and from here extends to the muscles of the shoulder of the same side, and soon reaches to corresponding muscles on the other side of the body. Again, there is rather a small per cent of cases where the disease begins in the lower limbs, usually in the anterior muscles of the leg below the knee, and from there travels upward to other muscles, affecting in turn other muscles of the legs, hands, arms, shoulders, etc.

In a majority of cases the muscles of respiration suffer sooner or later, and their impairment constitutes a great source of danger to life, and not infrequently their complete paralysis is the immediate cause of death.

In those cases where the disease begins in the hand or the lower limbs, the respiratory muscles are not usually interfered with until late in the progress of the disease. There are other cases, however, where the respiratory movements are interfered with early in the history of the disease, and where, from loss of power, they may cause death before the disease has had opportunity to invade less important parts. This is particularly true in those cases in which the disease begins in the muscles of the arm or shoulder on one side (usually the right), and is attended with considerable rheumatic pain at the beginning. In these cases the disease very soon affects the thoracic muscles; and their almost total paralysis, together with the general weakened condition of the body, is sufficient in many cases to cause death. In those cases in which the thoracic muscles are affected, the respiratory movements are carried on wholly by the action of the diaphragm.

CHART, illustrating the absolute and comparative strength of the different groups of muscles of the body, in a case of progressive muscular atrophy. The absolute strength is expressed in pounds avoirdupois by the figures at the angles, or points in the zigzag line. These figures should be compared with those *between* the two heavy horizontal lines in the middle of the chart, which represent the strength of the average adult male.



Respiration is then purely abdominal, and the walls of the chest may be almost motionless, or there may be merely a slight movement in the upper part of the chest. The wasting of the muscles of the chest, together with the unopposed atmospheric pressure, produces in these cases a flatness of the chest in front, and a narrowing of the chest from before backward.

In many cases, on the other hand, the diaphragm is the first of the respiratory muscles to suffer. The respiration is then carried on by the intercostal and thoracic muscles. These, however, sooner or later give way to the disease, and become weaker and weaker. The respiratory movements increase in frequency, and the breathing becomes more and more shallow. In the vain attempt to retain the breath of life, the muscles of "extraordinary inspiration" are called into play: the sterno-cleido-mastoid and scaleni muscles stand out like whip-cords; every muscular fiber that is not already degenerated, is taxed to its utmost, and the struggle for life goes on till death ends the scene.

The disease may confine itself to certain muscles first attacked until they are almost entirely deprived of any power of contraction, or until they are entirely wasted away, before new muscles are invaded, and the almost total absence of muscular fiber in some parts makes a striking contrast when compared with the apparently healthy and well-formed muscle closely adjacent. Again, several muscles may be involved apparently at the same time, and very soon again others, and so on until all the muscles of the body are involved, but not to such an extent as totally to deprive any of its function; that is, the disease seems to attack nearly all the muscles simultaneously, and the paralysis and wasting are quite as prominent in one part of the body as in another; there is quite as much difficulty in performing one movement as another, and this frequently before the disease is well advanced.

One sometimes sees a case in which the patient is able to perform all the movements of the body in health, but if tested, these movements will be found to be extremely weak. In such cases there will be a few muscles, such as the thenar muscles of the hand and some of the muscles of the shoulder, that may be slightly more wasted and weakened than others, and at the same time there may be a general shrinkage of nearly all the muscles of the body.

Between these two extremes, one in which a few muscles only are much affected at the onset, and that of a wasting and weakness of all the muscles of the body simultaneously, we may have all shades of variation and differences as to the severity and extent of muscles involved. Before the disease has progressed very far, the muscles of the trunk are involved, and this particularly manifests itself in attempts on the part of the patient to rise from a horizontal to an upright position.

The weakness of the muscles so apparent in performing ordinary movements becomes even more conspicuous when subjected to a careful comparative test. On the accompanying chart, which has been arranged under the direction of Dr. J. H. Kellogg, from the strength measurement of 100 adult men, we have (by extending the chart to meet the needs of the case) a graphic representation of the absolute and comparative strength of the different muscles of a case in which there was paralysis and atrophy of the muscles of the upper extremity, and paralysis and increased myotalic irritability without atrophy of the muscles of the lower extremity.

It will be seen at a glance, by referring to the chart, that with one or two exceptions the strength of all the muscles is below the average, and that the strength of the arms is much less than that of the lower limbs. Many of the muscles, in fact, are absolutely powerless, as is indicated by the zero marks on the chart, while the loss of power of other muscles varies, as is shown by the different figures in the chart indicating their absolute strength.

The total strength of the arms is represented by the number 235, while the total strength of the arms of the average individual is represented by the number 1132, showing a loss in the arms of about 80 per cent. Other comparisons may be readily made by referring to the figures in the chart.

(To be continued.)

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE LIVER AS A BILE-MAKING ORGAN.

BY DUJARDIN-BEAUMETZ.

Member of the Academy of Medicine, Physician to the Cochin Hospital, Paris.

Translated by J. H. Kellogg, M. D.

I WISH to speak especially of a new remedy, olive oil. The homœopaths, to whom we owe our knowledge of some new medicines, were the first to devise, nearly twenty years ago, the use of olive oil in large doses in the treatment of hepatic colic. They were, in this, in part faithful to their doctrine, since they combat hepatic calculi composed essentially of cholesterin, a fat body, by another fat body, *similia similibus*. We note, however, that they employ it in high doses, which is far from being a Hahnemannian doctrine. From the United States the method passed to England, where it was employed by regular physicians. In France, it was only after the work of Touatre, in 1887, that this preparation began to be used; and Chauffard and Duprét, in 1888, and Martial Durand, in 1889, Huchard, Germaine Sée, and Marciguey, have successively reported the good effects from this method.

All these cases have been collected in an excellent work by one of my students, Dr. Willemin, of Vichy, from whom I borrow some of the most important points of this study. To-day the cases are sufficiently numerous to enable us to assert that olive oil in large doses is one of the best modes of treatment of the pain produced by biliary calculi. It arrests the acute pain almost instantly, and considerably diminishes the period during which the patients suffer from heavy pains, weakness, and *malaise*.

Failures are the exception, and, strange as it may appear, the large quantity of oil is generally well supported by the patient, and is not vomited. It is necessary to give, at a single time, 200 grams (6 to 7 ounces) of pure olive oil. To remove this disagreeable taste, it is only necessary to have the patient rinse his mouth with water containing a little brandy or orange juice. For my service, I add to the oil 20 grams of beef bile for each 200 grams of oil. This mixture is slightly bitter, but it is well supported by the patients, and the results have been the same as with oil. I have been led to employ bile by the researches of Prévot and Binet, who have shown that this substance is a powerful cholagogue.

We are still ignorant of the true method of the therapeutic action of this oil. Touatre held that the oil always brought away the calculi. We now know the cause of this error. Touatre confounded with calculi the oil concretion resulting from incomplete digestion of the oil.

It can scarcely be admitted that the oil acts directly upon the calculi, for the oil cannot pass into the biliary passages. Stewart maintained that the oil is decomposed into a fatty acid and glycerine, the latter producing in the intestine reflex movements favoring a discharge of the calculus. Others, particularly Rosenberg, consider bile as a powerful cholagogue, and that it is this cholagogic action which explains the favorable effects of the oil.

Finally, it may be mentioned that the direct action of the oil upon the orifice of the common duct, and especially upon the adjacent region of the duodenum, tends to diminish the reflex spasm which is the first cause of the colic. For myself, I am ready to adopt the opinion of Willemin, who thinks that oil in large doses acts in several different ways; first, as a cholagogue, then by diminishing reflex action, and finally, by favoring the descent of the calculus in the intestine by its laxative action. Whatever may be the mode of its action, the number of successful cases is to-day so large that before resorting to the injection of morphia, we should always make our patients suffering from hepatic colic take the single dose of 200 grams of olive oil, either with or without the addition of beef bile.

It remains for me to say a few words respecting surgical intervention in cases of biliary calculi. The surgery of the abdomen has made great progress in recent years, and the liver has participated in this surgical progress. Large abscesses of the liver have been opened, portions of the liver have been resected, the liver has even been sutured in its normal posi-

tion, but especially worthy of mention are operations upon the gall bladder, which is sometimes simply opened (cholecystotomy), and sometimes completely removed (cholecystectomy). The first attempts made by Lawson Tait and Langenbuch, have been rapidly imitated in different countries, and in France the cases of Terrillon, of Terrier, of Routier, and of Périer, are a sufficient demonstrasion that these operations upon the biliary passages have entered into the domain of current surgery.

Whenever an insurmountable obstacle exists to the outflow of bile, so that the gall bladder becomes distended so greatly that it may even be confounded with a hydatid cyst, whether the cause is a calculus or an alteration of the biliary passages, it is the duty of the physician to employ surgical measures to secure the cure of the patient, and in a great majority of cases these will be followed by success.

To the already quite extended category of different forms of icterus, there has been added, recently, a new variety, that of infectious icterus. Guided by the new methods of investigation instituted by Pasteur, investigators have sought to determine whether or not the bile contained micro-organisms, and by what means these organisms could gain entrance to the bile. The clinical symptomatology of this hepatic infection has been established, and conclusions have been reached which are interesting, both from a clinical and from a therapeutic standpoint. All these facts are fully presented in a very remarkable thesis by Dr. Ernest Dupret.[1]

Bile is, in the normal state, free from microbes, and that, in spite of the presence of the numerous pathogenic microorganisms constantly present in the duodenum, and even in the ampule of Vater; but in the pathological condition the barrier is overleaped, and the bile is then infected by numerous pathogenic microbes.

This infection may occur, as remarked by Dupret, by five different channels,—the lymphatic, the arterial, the two venous (portal and hepatic), and the biliary.

Infection by the hepatic channel is very rare. As to infection through the arterial circulation, this occurs only as the result of general pyæmic infection. This is the cause of abscess of the liver, so frequent in purulent infection.

Infection by the portal vein is the cause of dysenteric abscess. Infection by the hepatic vein is very rare; however, Widal, Achalme, and Claisse have observed several cases of this sort.

Infection by the biliary way is much the most interesting, and will alone occupy our attention. Dupret has classified biliary infections as primitive and secondary, and the following table is a good *résumé* of the division which he has adopted: —

Biliary Infections	Primary,	Acute	Spontaneous. (Series of attacks of infectious icterus.)
			Induced. (Biliary infections complicating general affections.)
		Chronic	Chronic icterus.
	Secondary	Intrinsic obstructions by	Foreign bodies (inert or living).
			Calculus.
			Cancer.
		Extrinsic obstructions by	Tumors of the duodenum, pancreas, liver, etc.

Whether primary or secondary, biliary infection shows itself by a group of symptoms of which fever is one of the most constant characters. This fever is sometimes remittent, sometimes clearly intermittent, and it offers then the three stages of intermittent fever. These attacks may even assume a grave and pernicious form, and the patient may succumb during an attack.

Against infectious icterus of whatever form, the science of therapeutics is not without the means of defense. Antiseptic medication is especially indicated, and here is the triumph of salol, of salicylate of bismuth, of intestinal lavage with solutions of naphthol, and appropriate dietetic regimen, of which milk should constitute almost the exclusive basis.

Let us not forget that a favorable prognosis in these cases is to be drawn from the abundance of urine. The greater the quantity of urine produced in twenty-four hours, the greater are the chances of cure, and this diuretic action will be obtained by the exclusive use of milk. It is not necessary to enter further into the details of this antiseptic medication, as it is precisely the same as that which I have so often described.

However, there is one remedy which must take an important place in the treatment of these cases of infectious icterus.

[1] *E. Dupret, Les Infections Biliaires; Etude Bactériologie et Clinique. Paris, 1891.*

This is calomel. In a preceding lesson I have shown you that, upon experimental grounds, calomel is not a cholagogic medicine, and the experiments of Prévot and Binet confirm entirely those of Rutherford and Vinal. The last-named experimenters proposed to substitute the bichloride of mercury for the proto-chloride; but, according to the experiments of Prévot and Binet, these two salts of mercury cannot be considered as cholagogic medicines.

However, clinical experience has shown the great benefit that may be derived from calomel in certain hepatic affections, and in some countries, in England, for example, this drug is in current use. I believe that we may explain the good effects of calomel in the treatment of hepatic affections by its antiseptic properties. It is a powerful microbicide, and we can understand that in infectious hepatic affections secondary to intestinal disease, this drug may render great service. Dr. Sacharjin has very highly recommended the employment of calomel in these cases. He employs it in fractional doses, giving one centigramme (one sixth grain) seven times a day. However, I use calomel with extreme moderation, and that because I have seen many patients experience the phenomenon of salivation after its administration.

You know that it is demonstrated today, and in a positive manner, that the transformation of calomel into bichloride of mercury under the influence of foods containing chloride of sodium, is much more difficult than has formerly been believed. It is necessary to cease the remedy when the symptoms of gingivitis appear.

It remains for me to terminate this lesson by a few words respecting the urticaria of hepatic origin. You are familiar with the urticarias of dietetic origin, of which the most intense type is that which has been observed after eating certain shellfish or oysters. In these cases it has been maintained that icterus is produced by a toxic substance contained in the liver of these mollusks, a toxine which Brieger has isolated, and which he has given the name of mitylotoxine. These same phenomena of poison are often seen to follow the puncture of hydatid cysts, and it is probable that there is another toxine not yet isolated which produces this urticaria.

The same phenomenon occurs at the period of convalescence from infectious icterus, in particular from the icterus due to retention resulting in infection. When the bile is again thrown into the intestine, eruptions of urticaria of great intensity occur. These urticaria last for a certain time, then diminish, and finally disappear completely when the individual recovers his health.

I explain these particular forms of icterus as follows: It is probable that the bile retained in the infected liver is the point of departure. This bile contains a great number of microbes and toxines analogous to those which are developed in the liver of the mollusks. This bile, which is thrown in upon the surface of the intestine, when the obstruction is removed, is absorbed, and then produces the phenomena of intoxication, of which the nettle rash is only one manifestation.

Here also the only therapeutic means applicable is intestinal antisepsis, which is a prompt remedy, not only in urticaria following infectious icterus, but in the majority of urticarias, which are usually pathogenic eruptions, as remarked by Bazin, some being due to poisoning by medicinal agents, the majority, however, being due to poisons derived from the food. At the present time, physicians of the medical school of the Hospital St. Louis prescribe an exclusive milk regimen in the most intense urticarias, whatever may be their origin.

AUTO-INTOXICATION OF INTESTINAL ORIGIN.[1]

INTERNAL strangulation and constipation present two extremes, the maximum and minimum of intoxication of intestinal origin, and that morbid condition yet little known, which is termed *embarras gastrique*. The origin of the disease is obscure and complex. We are ignorant as to what is the first cause, but we know that there exists at a certain moment in this affection, a diminution of the saliva, from which comes a clammy condition of the mouth; of the gastric juice, in consequence of which the peptogenic power of the stomach is lessened; of the intestinal glands, which results in constipa-

1 Translated by J. H. Kellogg, M. D., from M. Bouchard's work entitled "*Leçons sur les Auto-Intoxications dans les Maladies.*"

tion. The appetite is diminished, a fact which is advantageous, since the digestive power is lessened, and consequently the quantity of food usually taken would give to the parasitic ferments a larger amount of putrescible matter. In these conditions of defective digestive secretion I see the possibility of a development of abnormal fermentations.

It is certain that the subjective troubles experienced by patients cannot be explained by the deficiency of food for so short a period. On the contrary, the production of putrid fermentations explains the bitterness of the mouth, the headache, and the prostration. If, then, I can give you any instruction respecting the first cause of the disease, I have some reason for supposing that intoxication must play a part in the pathogeny of some of the symptoms.

In certain persons, who, suffering habitually from diarrhœa, have only a single liquid and fetid stool each day, we observe nearly always headache, vertigo, rigors; they complain of bitterness of the mouth; their breath and skin have a disagreeable odor; now all these inconveniences may be made to disappear at once by evacuating the large intestine of its contents. A person who awakes with a sensation of exhaustion may be relieved at once by a simple enema. These facts constitute not a demonstration, but one more evidence to add to the probabilities in favor of the role played by intoxication in the genesis of nervous symptoms.

One may even see symptoms much more grave disappear after the simple evacuation of the digestive tube. Washing the stomach is not, properly speaking, a curative measure, but it removes malaise, headache, and migraine. In some patients suffering from dilatation of the stomach, washing the stomach causes a disappearance not only of the pain, the pyrosis, the acidity, but of all the other symptoms called reflex. Certainly lavage does not cure dilatation of the stomach, but it renders great service in palliating the most distressing symptoms, a service which is very manifest, but unhappily, at the same time also transitory. In my service is to be found a woman whose stomach was dilated. She suffered constantly from supra-orbital headache. Washing the stomach was always immediately followed by a disappearance of the headache.

When the stomach contains still more toxic matters, such, for example, as are found in intestinal obstruction, lavage has a utility not less manifest. Senator has already formulated this indication. M. Chantmess has also been able to verify it in a patient of my service suffering from intestinal obstruction from a cause unknown. The fæcal vomiting attested the accumulation of toxic matters in the stomach, and explained the general symptoms which accompany internal strangulation: small pulse, coldness from paralysis of the cutaneous vessels, etc. Four liters of the horribly fetid liquid were evacuated by the stomach tube, and the symptoms of peritonitis, which so closely resemble those of intestinal intoxication, quickly disappeared. A new accumulation of fæcal matters in the stomach was followed by the return of grave symptoms which another washing of the stomach caused to disappear, and the patient made a good recovery. He was cured, not by lavage, but the lavage gave him a respite by arresting the intoxication, thus giving, I suppose, time for nature to remove the strangulation.

There are other circumstances in which one may suppose that the stagnation of intestinal matters produces fever. After laparotomy the fever may be explained in many cases by a septic state of the peritoneum, and we see it disappear after the relief of the constipation. (Küstner.) Obstetricians are well acquainted with the fact that certain febrile symptoms which follow confinement disappear after the evacuation of the bowels, either spontaneously, or as a result of the administration of a mild purgative.

The injurious influence of intestinal stagnation after operation explains the ancient forgotten opinions in surgical practice. It was the rule to prepare a patient for operation by administering successively an emetic one day, then a purgative the next, and thus repeat two or three times. We do not to-day carry this preventive measure so far, but after the operation is performed, at least in cases of operations upon the abdomen, one may with advantage it appears, according to the testimony of M. Verneuil, induce movement of the bowels. These are clinical facts which agree with theory.

There are some cases in which it has been demonstrated that the grave symptoms of true indigestion were of toxic

character. Senator has observed in one of his friends a fact of this sort, in which the intoxication resulted from sulphureted hydrogen produced in the intestines of the patient. There were vomiting and eructations of gas, as well as gas emitted by the anus, with an odor of rotten eggs. The symptoms consist of faintings, anxiety, etc. But the poison may be revealed by the emunctories. The gas emitted blackened paper impregnated with acetate of lead. The stools and urine also contained hydrogen sulphide. We find, then, in this case, certain symptoms which form a part of the classic picture of poisoning by sulphureted hydrogen, from certain indigestions. The presence of this poison in the intestine was demonstrated also in the urine. It is certain, then, that it had traversed the blood.

In some persons special foods, though neither toxic nor putrid, produce regularly indigestion and grave symptoms. In each case if there is poisoning, it is due not to the food but to the non-digestion. The digestive juices fail to transform food which is repugnant to the stomach. The nervous system occasions some disturbance of the secretion. The gastric juice does not flow into the stomach, or the hydrochloric acid is absent at the moment of the conflict between the foods and the microbes. But hydrochloric acid serves not only to soften and to hydrate the alimentary mass, it must also protect it against the action of the parasitic ferments. The action of these ferments not being prevented, anomalous fermentations occur in the stomach and in the intestine. The products of these fermentations are absorbed, and as a result poisoning occurs, which happily is not grave, since the kidneys protect the organisms by elimination of the poisonous substances.

In 1882, I made the following observation: A man disliked cold fish, which had been cooked the day before. One day when he had made use of this food which was repugnant to his nervous system, digestion ceased and he experienced the ordinary symptoms of indigestion, first in the stomach and then in the intestine. The diarrhœa continued not only until the last part of food eaten had been eliminated, but still longer. It was attended by great prostration and distress. The first symptoms appeared only after a regular period of incubation of eight hours, during which, without doubt, the microbes had manufactured a quantity of poison which caused such a prolonged intoxication. And in order that so great an abundance of poison should be manufactured, it is evident that there must have been a great multiplication of the normal bacteria of the digestive canal. In fact, I estimate the quantity of microbes in this case to be one third of the fæcal mass. There was also an increase of the intestinal alkaloids, since from twelve grams of fæcal matter I obtained enough of the alkaloids to estimate the proportion to be fifteen milligrams to a kilogram of fæcal matter. There also appeared in the urine a great quantity of alkaloids, the amount being fifty times the normal quantity. In this case we see that without the introduction into the digestive tube of meat in a state of decomposition, and without the intervention of specific microbes, by the multiplication of normal bacteria only, there was produced a great increase of one, at least, of the toxic substances ordinarily to be found in the intestine.

I once observed three persons who were taken simultaneously with symptoms of the same sort. Breakfasting together, they had eaten some fish with some disrelish about ten or eleven o'clock in the forenoon. At seven o'clock in the evening, one of the three felt indisposed. The others sat down to dinner, but found themselves affected with identical symptoms before the meal was concluded. The symptoms of the disease were vertigo, prostration, vomiting, and diarrhœa. These symptoms were not the result of poisoning, since they appeared only after an incubation of eight hours. The diarrhœa was not that which follows indigestion, and which ceases at once after the elimination of the undigested foods; it continued night and day during eight days, with from eight to fifteen evacuations daily. The patient remained all this time in a half conscious condition. The three persons recovered, the duration of the disease being the same in each. This disease may be legitimately attributed to the putrefaction which occurred in the digestive tube, and to the multiplication of the microbes which manufactured the poisonous substances.

(To be continued.)

BACTERIOLOGICAL NOTES.

[THE notes appearing in this department are abstracts or translations prepared expressly for the BACTERIOLOGICAL WORLD AND MODERN MEDICINE, from original sources.]

Bacterial Complications in Cholera.— Mr. L. Rénon, of the Necker Hospital, describes four cases of cholera in which the symptoms presented were those of true cholera, but were not in all cases due entirely to the comma bacillus. Two of them were due to the bacterium coli communis; the other two were pure cases of cholera, in which the cholera germ was associated with the bacterium coli communis. It would seem that these facts have some practical importance from a diagnostic and pathogenic standpoint.

The Action of Tobacco Smoke on Pathogenic Micro-organisms.— Dr. Tassinari, of the University of Rome, has made numerous experiments on the action of tobacco smoke on bacteria. The last experiments he made confirmed his former reports, to the end that tobacco smoke is clearly bactericide. He concludes that cigar and pipe tobacco smoke possess very clear bactericidal power in general, and suggests that particularly on cholera bacilli tobacco smoke should be taken into serious consideration, as a prophylactic measure against affections of a specific character in the mouth. It seems to us that less objectionable antiseptics would be decidedly preferable.

Certainly the fact that tobacco will kill cholera microbes is no apology for the continued use of this drug, any more than does the fact that quarantine will hold cholera germs at bay argue for the perpetual maintenance of quarantine. The fact that tobacco smoke is germicidal, proves it to be a toxic agent.

Immunity and Cure of Experiment Animals in Diphtheria and Tetanus. — Messrs. Behring and Wernick and Mr. Kitasato have made very interesting and useful researches on these questions. Messrs. Behring and Kitasato have discovered a very important fact in their researches on diphtheria and tetanus. They discovered, in fact, that these affections could be cured by application of chemicals, such as tri-chloride of iodine, without destruction to the bacteria, and by the same means immunity could be conferred on them. In this case it would seem that these remedies do not act by their germicidal power, but by their neutralizing action, being free from destructive power with regard to the poison produced by the bacteria. Furthermore, in studying closely the properties of the serum of the blood of the animals vaccinated, it was found that this serum occasionally destroyed the poison itself.

These eminent bacteriologists are still at work on these interesting subjects, and we hope that they will contribute to the solution of questions so important.

Preventive Vaccination of Animals against the Cholera Microbe.— A good many experiments have been made of late with the object of preventing cholera, and some very interesting and probably very useful results have been obtained. Brieger and Wassermann cultivated the bacillus of cholera by using virulent germs from Massaouah. These germs were cultivated 24 hours in extract of thymus of a calf or peptonized broth, heated 15 minutes at 65° C. or 10 minutes at 80° C., and finally allowed to remain 24 hours in an ice chest.

Guinea-pigs received in four days 4 c.c. of this liquid in injection in the peritoneum. After a short malaise the animals recovered, and after the last injection became absolutely refractory to the comma bacillus. Two months after the inoculation immunity still exists, and it is probable that it will continue longer.

Simple culture in the extract of thymus, followed by a few days on ice without heating the culture at all, gave just as active vaccinal liquid. This fact confirms the specific action of the thymus on the cultures, a fact which had been recognized by Kitasato and the above named authors themselves.

Klemperer was able to render animals immune against cholera intoxication by different processes. First, by a process analogous to the preceding; that is, by inoculation of 1 c.c. daily for five days, with a culture maintained during three days at a temperature of 40.5° C. The animals thus treated supported very well a dose of cholera poison fatal for those not thus protected.

The simple heating of the culture at 70°C. during 2 hours produces a vaccinal liquid so active that in 17 hours after a single injection in the peritoneum of 2.5 c. c. of this liquid, tolerance was acquired for the usually fatal dose.

The action of the constant current of 20 milliamperes on a culture of one day, kills the bacilli completely, and produces an attenuation of the poison and a very acceptable inoculation vaccine.

Finally, Klemperer, has been able to confer immunity to guinea-pigs by means of blood serum of rabbits rendered refractory by injection of cultures attenuated by heat.

According to Gamaleia, the dog is more sensitive to cholera than most other animals serving for experiments in the laboratory.

Preventive Inoculation of Hog Cholera in Man.— Haffkine has demonstrated the possibility of vaccinating against hog cholera in human beings. He attempted the inoculation on himself first, and then on other persons. He used an attenuated choleric virus. The disorder provoked by this attenuation lasted scarcely 24 hours, and consisted only in a slight elevation of temperature with some fever (headache, dry mouth, high colored urine) without any derangement of the intestines. There was a local alteration consisting of a little pain at the point of inoculation, with swelling of the skin in the neighboring ganglia. All these symptoms disappeared before the fourth day after inoculation.

The injection in these same persons of virus increased in virulence by successive passages from the organism of the guinea-pig, in order to get a fixed virus, and killing guinea-pigs and pigeons surely, produced in man no more serious symptoms than those just described.

Haffkine concludes from these trials that inoculations may be practiced on man with the greatest safety, and he thinks that the human organism would have acquired very certain immunity against choleric infection six days after vaccination.

Ferran, of Barcelona, who, as everybody knows, began to inoculate against cholera as far back as 1885, has addressed a note of priority to the Society of Biology in France. This investigator claims that the culture of the comma bacillus of Koch in broth loses its virulence very rapidly, to such a degree, in fact, that the cultures may be drunk in small quantities with impunity, and inoculated at a dose of 2 c. c. in the connective tissue. He claims that in order to sustain and re-inforce immunity created in himself and patients, he has recourse to the very simple process of drinking a few drops of the culture from time to time.

Bacteriological Diagnosis of Cholera. — Laser published a note in *Berl. Klin. Woch.* No. 32, in which a very simple method of bacteriological diagnosis of cholera is explained. It is as follows: —

Inoculate a series of tubes containing peptonized broth or gelatine peptone with the suspected fœces to be examined; an equal number is inoculuted with the fœces of a person in good health. The whole is placed in an incubator and in 24 hours the diagnosis can be made by the odor, the tubes containing the culture of the choleric microbe emitting a characteristic repulsive odor which cannot be mistaken, as it can be compared with the result of the cultures made from the healthy subjects. The slightest quantities of fæcal matter (mere particles) should be used.

The diagnosis will be confirmed after a thin scum is formed on the surface of the culture, and after 48 hours the action of the "cholera-roth" (rose-violet by the action of strong acid) is obtained. Examination is completed by microscopical analysis of the fæces and the scum of the culture.

A New Leucomaine.— It was in 1881 that M. Armand Gautier discovered a new class of alkaloids derived from proteid matters, to which he gave the name of leucomaines. They are bases formed in the living cells and partly eliminated by the urines. Mr. A. B. Griffiths, on the same basis, succeeded in obtaining a curious alkaloid from the urine of epileptics. This poisonous leucomaine produces trembling, intestinal and urinal evacuation, dilation of the pupil, convulsions, and death.

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MICROBES IN BREAST MILK.

INFLAMMATION in the mammary gland, followed often by abscesses, is not always regarded with the importance that the case demands. The writer has had occasion to study such cases clinically and microscopically, and is in a position, at this early stage of his observations and researches, to state that such inflammations are sometimes at least of a specific character, and are consequently dangerous to the nursing child.

It is not uncommon to find mothers insisting on nursing a child even after the inflammation is pronounced, and occasionally until the ripening of an abscess.

A case of recent occurrence in which inflammatory spots appeared here and there in the glands, was successfully treated for a time; all the swelled and hardened spots disappeared. Nursing had been continued during the treatment. The child from the beginning of the trouble until its decline did very well. At this point it seemed to digest miserably. Soon a small nodule was felt deep in the left breast of the mother, beneath the areola of the nipple. It became very painful and hard. At the same time the child became ill. The food fermented rapidly in the bowels, and evidently produced toxines which caused stupor. The alimentary canal bloated with gas; the fæces were full of mucus, and emitted a putrid odor.

The milk was examined microscopically, and was found to contain pus and cocci. Having no culture media at hand, it was impossible to make cultures. The breast milk was discontinued, and peptonized cow's milk, sterilized, was used instead, and the child rallied (after, of course, a proper disinfecting treatment of the alimentary canal).

This is only one instance of several observations pointing in the same direction. It seems to the writer that in such cases the fermentation in the alimentary canal is set in by microbes in the mother's milk — germs similar, perhaps, to those found in the exterior in healthy cow's milk, and probably often in diseased cow's milk; for mammitis in milch cows is not uncommon, and this milk is often sold to the unsuspecting public.

P. P.

REST-HOUR.

FEW chronic invalids appreciate the value of an hour's rest in the middle of the day. Many persons condemn themselves to confinement for a whole day in bed, sometimes, indeed, for two or three weeks of this sort of penance, by neglecting to employ the ounce of prevention which is so readily afforded by a little rest before a complete breakdown.

Chronic nervous invalids are not infrequently in the condition of the man whose bank account is completely exhausted, and who must now eke out a parsimonious existence by practicing the greatest economy in his expenditures, since his outlays of means cannot exceed his daily income unless by extraordinary economy or the cutting off of unnecessary expenditure, he succeeds in accumulating again a small reserve fund.

The man who has exhausted his stores of nervous energy until he finds himself a nervous bankrupt, suffering from the well-recognized symptoms of neurasthenia or nervous exhaustion, cannot expect ever again to be able to indulge in the lavish

expenditures of nervous energy which were the original cause of his breakdown. It is often necessary, indeed, that such a nervous invalid should reduce his expenditures of energy to the lowest possible point, so as to allow of an accumulation of strength to a sufficient extent to enable him even to engage in the ordinary duties of life. For many such invalids, an hour's rest in the middle of the day would be a most valuable means of "keeping up."

An invalid who cannot endure the strain of continuous effort for from eight to twelve or fourteen hours, may be able to maintain efficient activity for three, four, or five hours without difficulty; and after resting an hour or two, he may find his forces replenished so that he can renew his labor for the same length of time as before; and yet the same invalid might find himself so broken down by prolonging his effort an hour or two beyond the proper limit, as to require two or three days, or even as many weeks, for recuperation.

There are many nervously broken down men and women who are still struggling on with the active duties of life, who would be marvelously helped and relieved of the great burden of mental and nerve distresses of various sorts, by taking a whole day's rest in bed now and then; even half a day once a week, if a whole day cannot be spared from the active duties of life, may prove in many cases of invaluable service, and will greatly increase the invalid's efficiency.

Many chronic nervous invalids, whose cases are too chronic, and whose breakdown has been too complete for a perfect cure to be effected, have been made to live for years very comfortably, practically free from serious inconvenience, by adopting this plan at the suggestion of the writer, and have expressed themselves as grateful for the relief from brain-fag, nerve-strain, and a variety of accompanying ills, which is thus afforded.

The exercise cure is doubtless needed in a far greater proportion of cases than the rest-cure, and yet there are now and then cases in which rest in bed for a few hours, or even for a whole day, will prove of greater benefit even than an excursion into the country or a tramp in the woods.

HEREDITY.

THE question is constantly asked, "To what degree is heredity responsible for the moral and physical infirmities from which human beings suffer? According to Galton we inherit one tenth of our original nature from our grandparents, and one fourth from our parents. The fact of heredity is well recognized in the common expression, "a chip of the old block." The influence of heredity is well shown in India, where a caste exists for every trade. Fathers consider it a waste of effort to undertake to teach their sons a trade different from their own, recognizing the advantage of hereditary aptness in the children for their father's trade or profession.

India also affords another illustration of the national deterioration which has resulted from the practice of secluding the women, and condemning them to a life of ignorance and comparative idleness, which has existed for many generations. Fathers and mothers sharing equally in the transmission of hereditary qualities, male as well as female children suffer from this deteriorating influence, and thus the race has steadily retrograded, from the golden age of Hindu civilization, when the masterpieces of Sanscrit literature were produced, to the present time. An Indian writer recently concluded an address with this remark: "I feel justified in concluding my address as Milton's Satan concluded his speech to his followers lying at his feet in the oblivious pool of Lethe, with the words,—

"'Awake! arise! or be forever fallen.'"

Unquestionably, heredity accounts for much of the nervous weakness and other

functional disorders from which so large a proportion of the natives of civilized countries suffer at the present day.

Bacillus Coli and Eberth's Bacillus.—Great interest has been aroused in the bacteriological world by the studies which have been made within the last year or two upon the relation between the bacillus coli communis and various inflammatory and septic conditions of the body. Of especial interest have been the studies which have been undertaken to show the relation between this common microbe, which is always present in the intestine, and the bacillus of Eberth, which has been supposed to be the specific cause of typhoid fever. Attention was first called to the possible relation between the bacillus coli and typhoid fever by Rodet and Roux, who found the pure culture of the bacillus in the pus furnished by the localized peritonitis occurring in typhoid fever, and also observed it in abscesses of the liver occurring as a complication in this disease. In an epidemic of typhoid fever, they found great quantities of the bacillus coli in an almost pure state in the stools of the patients, but were unable to find Eberth's bacillus in a single instance. In one case they demonstrated the presence of Eberth's bacillus in the spleen by means of puncture, although this bacillus was present in the stools, which contained, however, the bacillus coli in an almost pure state. Vallet has more recently taken up the study of the subject, and has likewise found that Eberth's bacillus is absent in many cases of typhoid fever, while the bacillus coli is invariably present. These observers hold that the peculiar conditions present in typhoid fever are the cause of biological changes in the bacillus coli, which give it the characters heretofore recognized as peculiar to Eberth's bacillus, from which it appears that Eberth's bacillus is only a transformed bacillus coli.

From these and other studies, it appears that the bacillus coli is capable of being transformed, under special conditions, into a variety of forms, and is capable of producing various pathological conditions. Its presence having been demonstrated in cases of abscess, pleurisy, peritonitis, dysentery, and cholera nostras, as well as in typhoid fever. It has also been learned that the bacillus coli may undergo the changes by which it becomes a virulent microbe outside of the body, as in water-closets and cesspools, as well as in the body. The evidence is, in fact, that the bacillus, when obtained from cesspools and water-closets has more virulent properties than when derived from human intestines, and that its virulence is even greater than that of Eberth's bacillus.

The important sanitary bearing of these discoveries is evident.

J. H. K.

The Sinusoidal Current.—One of the editors of this journal read a paper upon this subject at the annual meeting of the American Electro-Therapeutic Association, held at the Academy of Medicine in New York City, Oct. 4 to 6, 1892, the following brief abstract of which appeared in the *Electrical Engineer:*—

"Dr. J. H. Kellogg, of Battle Creek, Mich., read a paper on 'The Physiological Effects of Magneto-Electricity of Regular Variations' or sinusoidal current. The author began by referring to M. D'Arsonval's studies upon the physiological effects of the alternating magneto-electric current, and quoted his statement that 'The intensity of the motor, or sensory, reaction is proportionate to the variation of the potential at the point excited.' The author some years ago experimented with a small magneto-electrical apparatus, or telegraph generator, and found that this machine produced powerful but painless muscular contractions. He then made an apparatus for graphically representing currents, from which many tracings from

the machine referred to and also various forms of faradic machines were made. A number of these curves were shown. That due to the faradic current was uneven with respect to the zero line, while that of the magneto-electric machine corresponded exactly with those obtained by D'Arsonval. The comparative painlessness and great penetrating power of the sinusoidal current were especially emphasized. An induced current capable of producing equally strong contraction is so painful as to be almost intolerable, and the same is true with current from a static machine. Experiments upon the effect of this current on the sense of taste, the olfactory sense, and the auditory sense, are now in progress. The effect upon the optic nerve is attributed to its remarkable power of diffusion or penetration. Dr Kellogg's device for the graphic representation of the curves, consists of an electro-magnet arranged to form an annular field in which a delicate solenoid is made to move by an alternating current. This solenoid acting on the short arm of a delicate lever, compels the long arm to scribe its movements upon a rotating cylinder covered with smoked paper."

Scientific Exposure of Magnetism Frauds.— At the meeting of the American Electro-Therapeutic Association, held at the Academy of Medicine, New York City, October 4 to 6, which we had the pleasure of attending, Dr. Frederick Peterson and Mr. A. E. Kennelly, of the Edison Laboratory, reported the "results of some physiological experiments with magnets," which they had conducted at the Edison Laboratory, employing for the purpose magnets of great power, and of sufficient size to require two men to lift them. The magnets were arranged in such a manner as to secure the greatest possible amount of magnetic energy in action. Frogs' blood and other fluids, as well as human beings, were subjected to the influence of the magnet. We quote the following brief abstract of the paper read by these gentlemen, from the *Electrical Engineer* for October, 1892: —

"After a few words in regard to the effect of magnetism upon certain forms of hysteria, etc., and quoting Profs. Benedikt, Roberts, Bartholow, and Dr. Vansant on the subject, the authors described experiments made by them with magnets of great power at the Edison Laboratory at Orange. The pole-faces of the magnet, which two men were required to lift, were 1.2 cm. apart, and between these poles objects were placed for observation. The intensity of the field was about 5000 C. G. S. lines per square cm. A drop of water on a glass slide in this field was visibly distorted. Experiments were made on blood, which was found to be unaffected in any way. Experiments upon frogs failed to give any result. Then the effect of a continuous current was noted, and circulation was found to cease. Benedikt's statement that magnetism will produce paralysis was then tested. A set of idle field magnets converging into a cylinder two feet in diameter and seven inches deep was employed. In this cylinder a dog was placed for five hours without the slightest visible effect. Experiments were next tried upon the brain. The armature and one journal were removed from a dynamo converting about 70 h. p. at full load, and in the space between the pole-pieces the subject placed his head. The intensity of the magnetic field produced was about 2500 C. G. S. lines per square cm. A switch was arranged to open and close the exciting circuit. Sphygmographic tracings, taken continuously, showed no change in regularity.

"The respirations were not changed in the least, and there were no sensations that could be attributed to magnetic influence. Experiments in connection with reversed magnetism also failed to show any effect upon the subject. From these experiments, the authors conclude that

the human organism is unaffected by the most powerful magnets known to modern science; that neither direct nor reversed magnetism exerts any perceptible influence upon the iron in the blood, upon the circulation, upon ciliary or protoplasmic movement, upon sensory or motor nerves, or upon the brain."

The experiments above described seem to settle in the most positive manner, the question as to whether the magnet is possessed of any therapeutic virtues. If experiments with a magnet with an electrical current capable of doing work equal to a twenty-horse power produces no effect whatever upon the nerves, the heart, or the blood, it is evident that the toy magnets which are peddled about the country in the form of magnetic insoles, magnetic garments, etc., can have no possible influence upon the human body. These contrivances are simply mind-cures, so far as magnetism is concerned; all that is possible is that in some instances some benefit may be derived from the abdominal supporters, insoles, and other appliances in which the magnets are concealed.

THE TEA AND COFFEE HABIT.

The facility with which intelligent human beings acquire poison habits is one of the anomalous physiological problems presented by modern civilization. Wherever the human race is found, if there is to be found in the same portion of the earth a drug capable of producing artificial felicity, it is certain to have votaries more or less numerous, each of whom will be loud in the praise of the marvelous virtues and the innocuous properties of the particular drug to which he is attached. The Chinaman finds his soporific heaven in smoking the inspissated juice of the poppy. The native of the Orient undertakes to lift himself to a higher level of artificial bliss by means of Indian hemp. The Siberian chews his mushroom, while the North American and his imitators in almost every land, in the mystic rites of smoking, chewing, snuffing, and dipping, figuratively bow down to the god *nicotiana tabacum*.

Every leaf, bark, root, and seed equal to producing a temporary nerve-tickle, has been hunted out, experimented with, and utilized as a source of artificial exhilaration. So universal is this disposition, that some have even been led to suppose it a physiological demand, the gratification of which is as necessary as eating and drinking, or the supply of any natural want. The untruth of this popular notion is clearly shown, however, by the fact that the gratification of a physiological appetite is not attended by the production of disease, while a narcotic or stimulated appetite brings in its train a multitude of maladies and miseries, each peculiar to the special drug by which it has been produced. Healthful foods taken in quantities sufficient to satisfy the normal appetite, are never productive of disease. This cannot be said of a single one of the felicity-producing drugs, to the use of which the human race, or any portion of it, is addicted.

But the purpose of this article is not to portray the evils arising from the long category of poison habits which human beings cultivate in different portions of the world, nor even to treat exhaustively mischiefs arising from a single one of the deceptive drugs which hold and enslave so many millions of the human race, but rather to call attention to the fact that some commonly used and little suspected drugs, notwithstanding their apparant harmlessness, carry, under the cloak of a brain-soothing, a nerve-tickling power, a poison laden draft, which strikes deep into the vitals of those who seek to hide behind the care-effacing, nerve-exciting agent.

It is a fact which is pressing itself more and more emphatically upon observing physicians in all civilized countries, that

the undeniable disease called "nervousness" is increasing in prevalence at a most alarming rate. This is a matter of common observation and remark. There is a decreasing number of physicians who do not believe that the apparently harmless practice of tea and coffee drinking, is, in part at least, responsible for this growing depravity of nerve-cell and fiber. To prove this beyond any possibility of cavil, to the satisfaction of every man, is a task which not one will attempt to undertake, since the complexity of the forces in operation which tend to modify or to deteriorate the human constitution under the artificial conditions of civilization, renders every problem relating to the physiological or pathological influence of habits most difficult of solution.

That tea and coffee have a decided influence in the direction suggested, will not, we think, be disputed by any intelligent, observing medical man, since evidence of a very positive character is afforded in the fact that while the influence of moderate doses, even though long continued, may be inappreciable or undiscoverable in the midst of a multitude of other possible causes, and without any morbid manifestation, it requires only a slight excess to develop the toxic properties of theine or caffeine? And furthermore, it is well enough known that what might have been, for one person, a moderate dose, that is, a dose so small in quantity that its effects are not immediately observable, may be for another person sufficient to produce toxic effects.

The toxic effects of the "cup that cheers, but not inebriates," are familiar to every one as the sleep-banishing property of a strong cup of tea. Not one would dispute for a moment, that a drug capable of producing drowsiness or sleep in a person who is not fatigued or in a condition to require sleep, must be possessed of a toxic property. Is it not quite clear that a drug capable of producing, temporarily, the most obstinate insomnia, even in a person whose physiological state is such as to demand recuperation or sleep, must be possessed of poisonous properties of a very positive kind?

Lehman, the eminent German physiological chemist, unhesitatingly pronounced caffeine to be a poison, notwithstanding the claim that he, even at that day, had made it apparent, as an apology for the use of a mild narcotic, that it was a food; and the evidence that he was right, which was based upon the results of experiments upon himself and others as well, in studies of the close relation between the chemical constituents of caffeine and those of the well-known alkaloidal poison, is constantly affirmed by evidence accumulated by the experimental researches of physiologists and physiological chemists.

REVIEWS.

Drinking Water and Ice Supplies.—By T. Mitchell Prudden, G. P. Putnam's Sons, Pubs., New York and London. Like all the works of Dr. Prudden, this is an excellent and exceedingly practical work, full of sound suggestions and unquestionable demonstrations tending to educate the masses on the necessity of pure water and pure ice. The book is divided into seventeen chapters, covering the ground fully and tersely, so that any one may gain the most valuable information on the subject of water.

It is undoubtedly true that water contains, in many quarters, the elements of disease, and causes sporadic and epidemic affections often of a most fatal character. Unfortunately, the world does not see it, and seems indifferent to the scientific teachings which are sent forth in public print. Dr. Prudden's book is a little volume of 139 pages, well illustrated, and is the first short, concise English work on water, under the light of to-day, written in a manner attractive and free from technicalities. Everybody should possess a copy.



WHERE TO SPEND THE WINTER!

AT THIS SEASON OF THE YEAR THOUSANDS OF INVALIDS ARE SERIOUSLY CONSIDERING THE QUESTION,—

WHERE CAN I SPEND THE MONTHS OF **November, December, January, February, AND March,**

WITH THE GREATEST PROFIT?

THE ANSWER

to this question will depend upon what the individual wishes to accomplish by a sojourn away from home. If rest and recuperation are the chief requirement, the Southern and Pacific Coast States offer numerous attractions which draw throngs of semi-invalids and valetudinarians every year.

If, in addition to rest and recuperation, the invalid needs a careful study of his diseased conditions, and an intelligent regulation of diet, exercise, and all other health conditions,—in other words, scientific health culture, efficiently carried out by the aid of the best known medical means and appliances, thoroughly trained nurses and attendants, and competent physicians,—then the choice between the most desirable places becomes very much restricted. There are certainly few institutions in this country where the needs and desires of an earnest, health-seeking invalid can

be satisfactorily met. Such places can be counted on the fingers of one hand, and are, perhaps, little known because of the fact that the managers of such institutions are conducting them in a scientific, and in some instances a philanthropic spirit, and consequently do not employ as a means of winning patronage, the emblazoned advertisements, the truth-sacrificing circulars, and other advertising methods commonly resorted to by the proprietors of mineral springs establishments, bogus sanitariums, and other so-called "health institutions" and quasi-medical establishments, with which the country abounds.

The advertisements of these establishments do not appear in public prints or popular magazines because such advertising is closely akin to quackery, and brings those who employ it into bad company.

The managers of the Sanitarium at Battle Creek, Michigan, many years ago undertook to organize a thoroughly scientific institution which would represent rational medicine in its most advanced form, and would be exactly what it professed to be — an institution where patients are honestly and fairly dealt with, treated at reasonable rates, given kind attention and comfort, and opportunity for the recovery of health under the most favorable conditions. The majority of patients treated in this institution are sent to it by physicians who by personal acquaintance, or through the reports of their patients, have become thoroughly familiar with the character of the institution and its management.

BRIEF DESCRIPTION OF THE Sanitarium.

BATTLE CREEK, one of the most beautiful and prosperous cities of Michigan, is centrally located in the salubrious Peninsular State. Its population is 20,000, while its death rate is but seven per thousand. Battle Creek is situated on two great thoroughfares of railway travel between the East and the West, being at the junction of the Grand Trunk and the Michigan Central lines; and two other railways make it easy of access from the South.

The city has an electric railway and is lighted by electric lights. A great number of pleasant drives are afforded by its well-kept and shaded streets.

The Buildings are lighted by a 700-light plant, Edison incandescent system.

Safety Hydraulic Elevators. Outside stairways for fire escapes accessible from every window.

The Institution affords facilities for baths of every description: Turkish, Russian, vapor, electric, water baths of all kinds, and the electric light bath. Independent accommodations for ladies and gentlemen, sufficient for 80 persons at one time. More than 800 feet of glass for sun baths.

A General Parlor, 40 x 50 feet, is luxuriously furnished with Dhagistan rugs, easy chairs, etc. The Dining-Room has a seating capacity of 400, is beautifully lighted and ventilated, and always cheerful. No kitchen smells. Cuisine unsurpassed; table service excellent. Everything an invalid needs, and special dietaries prepared as directed.



THE CONSERVATORY.

The Gymnasium, 85 x 45 feet, is supplied with every appliance for exercise, and furnishes special instruction and class drills in Delsarte and Swedish gymnastics, under a trained director. Exercise by prescription.

The Swedish Movement Department, both manual and mechanical, is the most extensive in the United States. Vibrating bars and seats, kneaders, rubbers, beaters, shakers, and manipulating appliances of all sorts.

The Electrical Department contains every improved appliance for medical applications of electricity, Galvanic, Faradic, Dynamic, and Static electrical apparatus and appliances for electrolysis, electro-cautery, etc.

An Aseptic Maternity on the cottage plan (steam heat and thorough ventilation), provides the best possible conditions for lying-in patients, with experienced professional attendance and rigorous aseptic management.

Special Departments for surgical cases, eye, ear, throat, and lung diseases, nervous diseases, genito-urinary diseases of men (non-specific), opium and alcohol habits, and diseases of women. A kindergarten and nursery, to keep the children happy and out of mischief.



SUMMER HOUSE AND FRESH-AIR INLET.

Three Fine Greenhouses, maintaining a magnificent collection of palms and various tropical flowers and plants, keep the house filled with bloom during the winter season. Flowers are everywhere indoors during the winter season. Patients can visit the greenhouse at any time without going out of doors.

Glass-Inclosed Sun-Parlors and Verandas for winter sunning and promenading.

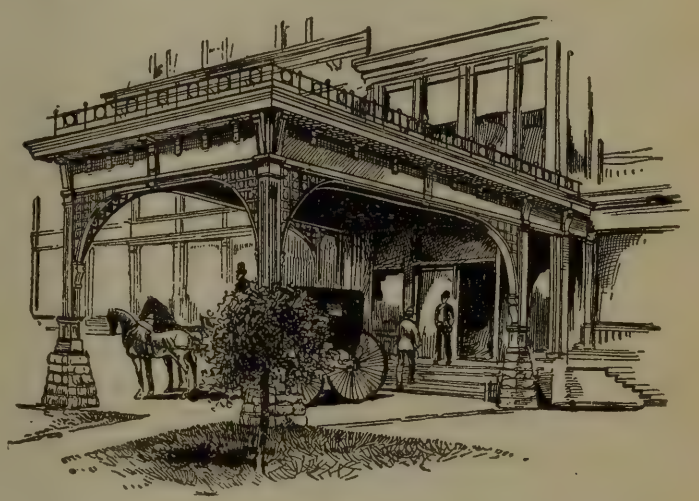
Pure Water from sandstone rock.

There are from 250 to 300 Employes in the Sanitarium service the year round, of whom from 90 to 100 are medical attendants and nurses. Also seven thoroughly trained physicians, and a large corps of manipulators skilled in massage and the Ling system of Swedish movements.

The Sanitarium Training-School, in which our nurses are trained, is the largest and most popular in the United States. Its course of training is the most complete and thorough of any school.

Tri-Weekly Lectures on popular medical subjects by the physicians.

Abundant Means for Recreation indoors during inclement weather. Facilities for walking, driving, and horseback riding at all seasons.



MAIN ENTRANCE.

The Sanitarium is Not a Pleasure Resort nor a fashionable hotel, but an ideal place for invalids needing good nursing, the benefits of regular habits, and scientific professional care and treatment, and who desire to become permanently well.

The Sanitarium Nursery and Kindergarten. This enables mothers to bring little ones with them without being burdened with their care and supervision. The children have the advantages of kind and experienced teachers and ample playgrounds.

For Further Particulars, see large circular and card of rates.

J. H. KELLOGG, M. D., SUPT.,

Sanitarium, BATTLE CREEK, MICH.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., OCTOBER, 1892.

THE ACID OF THE GASTRIC JUICE.

THERE has been an almost endless discussion among physiologists respecting the nature of the acid of the gastric juice. Quite a considerable number of eminent chemists have maintained that the normal acid of the gastric juice is lactic acid, and there have been physiological chemists of repute who have regarded the acidity of the gastric juice to be due, in considerable part, to acid phosphates. The majority of authorities have given their adhesion, however, to the views of Bidder and Schmidt, who regard the acidity of the gastric juice to be due to the presence of free hydrochloric acid. The experiments of Richet and others have thrown considerable doubt upon this theory, however, and consequently, much confusion has existed among physiologists upon a point which it would seem ought by this time to have been authoritatively settled. That lactic acid is normally present, in small amounts at least, in the early stages of digestion, is a fact which cannot be disputed; and that it plays a part of some importance in the digestive process, the writer has demonstrated to his own satisfaction, although just what part it acts in the normal chemical process of digestion cannot yet be fully explained by the data which physiological and therapeutic experiments have placed in our hands. The facts which the writer desires to present in this brief article, it is believed will be found of interest in this connection, and will contribute something toward the settlement of this important physiological question. The facts to be presented are as follows:—

1. The results observed respecting the constancy of free HCl in the quantitative analysis of 413 different stomach fluids.

2. The results noted as regards the presence of lactic acid in the examination of stomach fluids.

3. Experimental observations respecting the effect of the addition of free hydrochloric acid to meat juice and other albuminous fluids.

4. Therapeutic observations respecting the influence of lactic acid upon the digestive process.

In this note, attention will be called only to the first two classes of facts, the third and fourth observations being reserved for a succeeding article.

1. *The Results of the Quantitative Analysis of 413 Stomach Fluids.*—The stomach fluids analyzed in this series of observations were furnished by 321 different individuals. The fluid was withdrawn from the stomach one hour after taking a test breakfast, neither food nor fluid having been taken since rising. The presence of hydrochloric acid was determined qualitatively by the use of the usual color reagents, Congo-red, methyl-violet, Günzburg's reagent, and the resorcin and sugar reaction. Each fluid was also carefully examined quantitatively by substantially the same method suggested by Bidder and Schmidt, which consists in first determining the total amount of chlorine present in the gastric fluid, then making a second determination, after evaporating the liquid to dryness without the addition of carbonate of soda, and drying the residue for an hour so as to drive off all free HCl. Subtracting the figures obtained in the second analysis from those obtained in the first, the difference will represent, of course, the exact amount of HCl existing in a free state in the fluid examined. No method of determining the amount of HCl present in the gastric juice more accurate than this has ever been devised, and indeed this method seems to offer all the advantages as regards accuracy that could be desired. It is evident that the only chance for error, if any exist, would be in the representation of too small a quantity of free HCl, since in the first determination the free HCl is wholly fixed by the carbonate of soda added, so that the only source of error likely to arise, will be found in neglecting to continue the evaporation of the dried residue in the second determination for a sufficient length of time to completely dissipate the free HCl present.

The results obtained were as follows:—

(a.) The presence of free HCl was indicated

by color reactions in 362 cases, or 87.6 per cent of the total number examined.

(b.) The presence of HCl was determined by the quantitative method, and in amount sufficient to be measured, in 307 cases, or 96.1 per cent of the total number of fluids examined.

It is interesting to note that free hydrochloric acid was found and the amount determined by the quantitative method, in every single instance in which its presence was indicated by color reactions, although the color reagents failed to indicate the presence of free HCl in quite a number of instances in which it was present in very appreciable quantity, as determined by quantitative analysis. In one instance the color reagents totally failed to indicate the presence of free HCl, although this acid was present to the amount of .020 grams of anhydrous acid in each 100 c.c. of stomach liquid.

It appears from these results that hydrochloric acid is a very constant constituent of the gastric juice, even under unfavorable circumstances, for nearly all the cases examined were persons who were suffering more or less from stomach disorders. The sixteen cases in which no hydrochloric acid was found by quantitative analysis, were all cases of hypopepsia of a very pronounced degree. Hypoacidity existed in all the cases, and lactic acid was present in only three of the sixteen cases.

2. *Observations Relating to Lactic Acid in the Analysis of 328 Stomach Fluids.*—The stomach fluids examined were furnished by 232 different persons, nearly all of whom were suffering more or less from disordered digestion. For obvious reasons, no quantitative estimation of the amount of lactic acid present was undertaken. Uffelmann's reagent was employed with all possible precautions. A watery solution of the residue obtained by washing the liquid several times with ether, then evaporating the ethereal extract, was used, but the presence of lactic acid was indicated in only 180 cases, or 54.9 per cent of the total number of fluids examined.

The evidence respecting the degree of constancy of lactic acid as a constituent of gastric juice afforded by this fact, cannot be said to be absolutely conclusive, on account of the want of a thoroughly reliable color indicator for this acid; but such evidence as exists, leads to the conclusion that this acid is much less constant as a constituent of gastric juice than is free HCl, and this observation still remains good, even if we consider lactic acid present in every case which presents any evidence of acid fermentation, since the addition to the figures above given of the 59 cases of acid fermentation in which the presence of lactic acid was not noted, making 259 cases in all, would still give 21 per cent of the total number of cases examined in which lactic acid was observed to be absent.

I do not know whether or not a study of this sort, including so large a number of cases, has ever before been made, and hence am not able to make a comparison of my results with those obtained by other observers. I ought to add, however, that every precaution was taken to avoid the ingestion of lactic acid with the food, and to exclude lactic-acid-forming ferments. To this end I discarded the use of the white raised bread commonly employed for the test breakfast, and used, instead, unleavened water-bread composed of whole-wheat meal with the addition of common salt to the amount of three fifths of one per cent of the bread taken.

Admitting the correctness of the above observations, it seems quite clearly established that free HCl is the normal acid of the human gastric juice, and that lactic acid, except in very small amount, plays only a subordinate part.

If it be suggested that the observations are inconclusive, because the digestion was disordered more or less in the majority of cases from which the fluids were obtained, this objection is negatived by a comparison of the results obtained in cases of hyperpepsia and hypopepsia respectively. Of the total number of cases examined with reference to lactic acid, 182 belonged to the class hyperpepsia, and 123 were cases of hypopepsia. Lactic acid was found present in 97 cases, or 53.3 per cent, of the cases of hyperpepsia, and in 63, or 51.2 per cent, of the cases of hypopepsia. If lactic acid is normally a prominent constituent of the gastric juice, we should expect to find it increased in quantity in cases in which the other elements of the gastric juice were found in excessive proportion; but, as shown by the above figures, this is not the case; instead, we find lactic acid occurring with equal frequency in cases of hypopepsia, in which also it was present the most frequently in excessive amount.

J. H. K.

(To be continued.)

CONVENIENT METHODS FOR DETERMINING CO_2.

The writer's interest in sanitary subjects led him some years ago to give attention to the subject of CO_2 analysis.

The need of some simple and accurate means of determining the quantity of CO_2 found in atmospheric air was especially felt. After experiments with different forms of apparatus for

making an estimate of CO_2, the apparatus shown in Fig. 1 was finally perfected. This apparatus consists essentially of two graduated glass bottles holding one liter each, connected by tubing in such a way that one liter of water can be made to siphon from one bottle to the

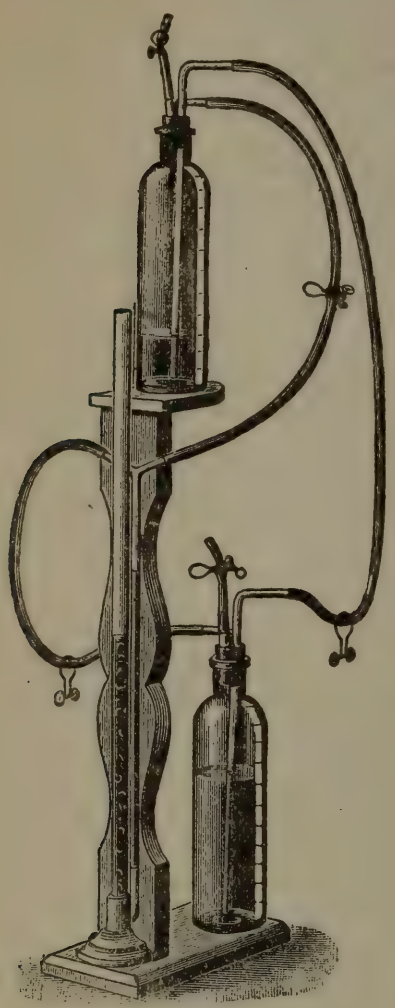


Fig. 1.

other; and a glass tube about sixteen inches in height, in the bottom of which is fixed a tube with a small aperture, is connected with the two bottles in such a manner that as the water siphons from one bottle to the other, the air contained in the empty bottle, as the bottle fills, will be forced through the small opening, and made to pass upward through the vertical tube, which is supported against the standard, which also serves to support the bottle from which syphonage is taking place. By replacing the bottle and replacing the pinch cocks, the passage of air through the solution is continued as long as may be required. If the air of a room is to be examined, the air is collected in one bottle and is passed through the apparatus to the other. If the air to be examined is contained in the rubber bag or a gasometer, it is only connected with the short-tubed bottle and admitted as required.

In using the apparatus, the vertical tube is partly filled with lime or baryta water, which absorbs the CO_2 contained in the air, which is made to bubble up through it from the aperture at the bottom. The lime or baryta water is colored by a solution of phenol-phthalein. The purple color produced by the phenol-phthalein disappears instantly as soon as the lime or baryta water contained in the solution is wholly neutralized by the CO_2, and is thus a most delicate means of determining when a sufficient quantity of air has been passed through the apparatus. It will be evident to any one at all familiar with chemical estimations that it is only necessary to know the amount of lime or baryta contained in the solution, to determine the proportion of CO_2 contained in the air examined.

To determine the amount of CO_2 in the breath is an operation in which extreme accuracy is required, as a physiological investigation and a most accurate method is required. M. Gomberg, M. S., who is at present in charge of the chemical work of the Laboratory, has perfected the method which he has employed in physiological researches which are being carried on in the Laboratory, and which will be recorded at a later date. The method which is, we think, in some respects unique, is thus described by M. Gomberg: —

The method that we employ for estimating CO_2 in breath is based upon a well-known principle, namely, absorption of the CO_2 in a standard solution of $Ba(OH)_2$, and titrating the excess of the baryta solution with standard oxalic acid. The mechanical devices for applying this principle are numerous. Some of them require special, somewhat expensive apparatus; others are cumbersome and involve inaccuracies due to change of temperature of the gas while handling the receptacle. The most accurate method, of course, is to pass a measured quantity of the gas through a drying apparatus, and then absorb the CO_2 in a Liebig's or a Geissler's potash-bulb. But this method requires a very considerable expenditure of time, and for this reason could not be employed in this Laboratory, where a comparatively large number of estimations are to be made in a day.

The method is as follows: (Fig. 2.) A Shiff's azotmeter (x) is filled with distilled water. It is then connected at its upper end with the rubber bag or gasometer containing the sample of breath to be analyzed, and is thus filled by downward displacement of the water. The fluid in bulb (b) is brought to a level with the fluid in the upright tube of the azotmeter. If none is at hand, an ordinary 100 c.c. burette will answer. Graduate it from the top, invert, insert a rubber stopper, and

connect the latter by means of rubber tubing with a funnel. From the surface of the water in the burette, the exact reading is taken, and temperature and barometric pressure are noticed.

Now a small Erlemeyer's flask of about 60 c. c. capacity, containing a measured quantity of standard Ba $(OH)_2$ and a couple of drops of phenal-phthalein solution, 2 per cent in alcohol, is connected with the azotmeter, as shown in the figure. All the connections are made with thick wall capillary tubing such as is used in gas analysis. By raising the bulb (b) and opening the stop-cock, the gas is slowly forced through the Ba $(OH)_2$ solution in very minute

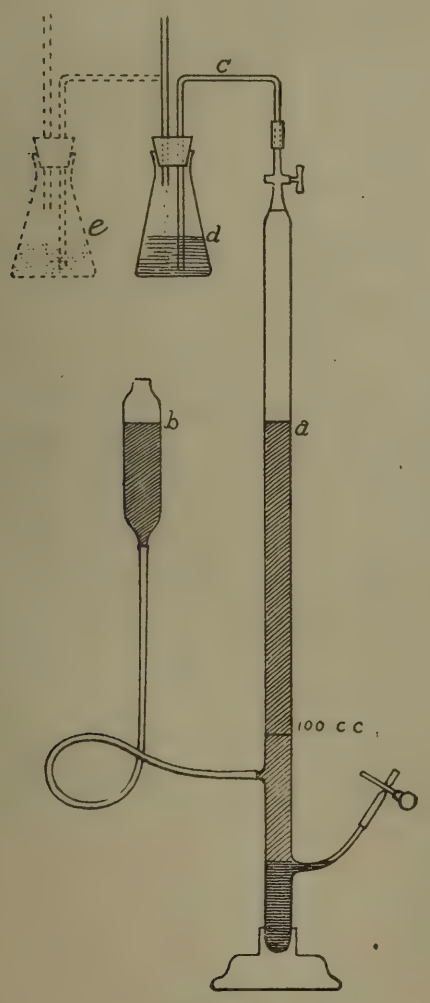


FIG. 2.

bubbles, thus exposing a large surface for absorption, to insure which the end of the delivery tube is pressed against the end of the flask. After all the gas is forced from the burette, the flask is disconnected, and the excess of Ba $(OH)_2$ is rapidly titrated with oxalic acid.

It is found by repeated trials that by careful management and occasional shaking of flask *d* no CO_2 escapes into a second bottle, *e* also containing an exact amount of Ba $(OH)_2$.

The advantages in employing this apparatus are evident: 1. The volume and the temperature of the gas employed can be determined very accurately; 2. The absorption of CO_2 by the water on the burette is practically nothing, as the surface of the water exposed is very small, and can be made absolutely nothing by using a saturated solution of common salt; 3. The rapidity of passing the gas can be regulated at will.

We employ a solution of oxalic acid containing 1.4081 gms. of the acid in a liter of water. 1 c. c. of this solution represents 0.25 c. c. of CO_2 at 760 mm. pressure and 0°C. The Ba $(OH)_2$ solution is made of approximately the same strength.

By taking the precautions usually employed in such work (as potash guards over the Ba $(OH_2$ reservoir and over the burette, etc.), very concordant results can be obtained, as is seen from the following:—

	c. c. Employed.	Bar Pressure.	Temperature.	Equivalent to c. c.	Per cent CO_2 by volume.
Sample 1.	99	744.5mm.	25°C	86	4.53
	95	744.5	24	83	4.70
	97	744.5	25	84.3	4.51
Sample 2.	99.5	744.5	25	86.5	4.22
	98.5	744.5	25	85.6	4.38
	97.5	744.5	25	84.5	4.31
Sample 3.	101	751.8	26	88.2	3.85
	98.2	751.8	26	85.7	3.81
	96.5	751.8	26	84.2	3.72

The Coloring Matter of the Micrococcus Prodigiosus.—This microbe, which is so common in the air, and produces a red color in the medium in which it grows, is capable, says M. Prillieux and Mr. Griffiths, of producing an alteration of the grain of wheat; it is the cause of the corrosion of wheat, and can be destroyed with a solution of sulphate of iron. Mr. Griffiths has examined the pigment which produces the red color in 500 potato cultures. It is soluble in alcohol and gives a red solution. This alcoholic solution is precipitated by the addition of water. The precipitated pigment, after filtration, is redissolved in the alcohol, and the alcoholic solution is evaporated at 40° C. The chemical formula of the substances is the following: $C_{38}\ H_{56}\ AzO_5$.

The alcoholic solution gives with the spectroscope two bands of absorption, one in the blue and one in the green; acids bring the solution to a carmine color; alkalies render it yellow.

PUBLISHERS' DEPARTMENT.

It May be Interesting to Know that when excursion rates are made to Chicago for people who live in the East, to enable them to attend the World's Fair next year, it is contemplated by the Western roads to also make excursion rates from Chicago to all principal business and tourist points in the West, Northwest, and Southwest, so that those who desire to spend a few weeks among their friends in the Great West may have an opportunity of so doing without incurring much additional expense. It may be well to consider this subject in advance of actual time of starting, and the Chicago, Milwaukee & St. Paul Railway Co. has issued maps and time tables and other instructive reading matter, which it will be glad to furnish free of expense upon application by postal card addressed to Harry Mercer, Michigan Passenger Agent, 82 Griswold St., Detroit, Mich., or to Geo. H. Heafford, General Passenger Agent, Chicago, Ill.

Home-Seekers, Attention! The United States Government has decided to open, Nov. 22, 1892, for settlement under the homestead law, the unearned lands of the Marquette & Little Bay Du Noquet Railroad, heretofore reserved from entry, in Northern Michigan. At the same time the right of the Ontonagon & Brule River Railroad has been denied to a large tract of land in the Upper Peninsula of Michigan. This gives an unprecedented chance to locate valuable timber and mineral lands, which are among the best in the Upper Peninsula, and are reached only over the North Star Route (Milwaukee & Northern Railroad) between Chicago and Lake Superior.

For further particulars address C. E. Rollins, Land and Immigration agent, 161 La Salle Street, Chicago.

The Diet for Wasting Diseases.—In typhoid fever, phthisis, pneumonia, nervous prostration, etc., where the vitality is low and the digestive organs weak, the use of Horlick's Malted Milk as a diet has proven very beneficial, often sustaining the strength of the patient and preventing excessive emaciation and assisting in rapid recovery where recovery is possible.

This preparation is composed of rich cow's milk and an extract of malted grain, containing all the elements of nutrition in a form most easily digested. At the same time it forms a delicious drink and one acceptable to the weakest stomach. Prepared for use by simply adding water.

A Modern Method of Medication.—Among the many methods of administering medicaments, the soluble elastic gelatin capsule is growing to be one of the most popular.

There are many efficient but unpalatable medicaments which may be readily exhibited in this way, without offending the palate of the most sensitive patients, and capsules are much easier to swallow and more soluble than pills.

Few physicians are aware of the many medicaments that are now administered in this way. Among these one need only mention the following to indicate the wide application of this method of giving numerous drugs:—

Apiol, balsam fir, balsam Peru, cascara sagrada, castor oil, castor oil and podophyllin, chaulmoogra oil, cod-liver oil, cod-liver oil and creasote, cod-liver oil and iodine, cod-liver oil and iodoform, cod-liver oil and iron, cod-liver oil and phosphorus, copaiba, copaiba and cubeb; copaiba, cubeb, and buchu; copaiba, cubeb, and iron; copaiba, cubeb, and matico; copaiba, cubeb, matico, and sandal; copaiba, cubeb, and sandal; copaiba, cubeb, and sarsaparilla; copaiba and iron; copaiba, cubeb, and turpentine; copaiba and sandal; creasote (beechwood), 1 minim; eucalyptus oil; gurjun balsam; linseed oil; liquor sedans; male fern and kamala; nitroglycerine, 1-100 grain; oil of pennyroyal; pichi extract; salol; tar, purified; valerian oil; Warburg's tincture; wintergreen oil; wormseed oil; quinine muriate and sulphate.

Of extra sized elastic-filled gelatine capsules, there are castor oil, 2½ to 15 gram; cod-liver oil, 2½ to 15 gram; male fern and castor oil; santonin and castor oil.

Messrs. Parke, Davis & Co. were among the first to make this method popular, and will be pleased to afford physicians interested all desired information concerning this agreeable method of medication.

Aristol.—Nearly all drugs, whether or not originally intended for external use, have been applied at one time or another to local, exterior traumatisms, in the once current belief that "remedies that are good within should be good without." The conspicuous failure of the many attempts to obtain a perfect dressing for suppurative conditions which should be equally good for accidental or operative injuries, constitutes an interesting section in the history of surgery. The promptness, for instance, with which aristol was adopted by practitioners demonstrated the great existing need of an adherent, stimulating, safe, and effective cicatrisant. The evidence thus far appears to demonstrate that aristol has not disappointed the profession in any of these particulars.

Malted Milk.—We have made extensive use of the malted milk manufactured by the Malted Milk Co., of Racine, Wis., for a number of years, and consider it a valuable addition to the medical armamentarium of a medical hospital or sanitarium. It is often more valuable, if possible, for the physician in private practice, as it places in his hands a remedy which is at the same time food and medicine, and combines properties of peculiar excellence in the class of cases to which it is adapted. Many patients who cannot take milk in any other form can take it in this form, and with great benefit; in fact, now and then physicians take malted milk themselves, on account of the ease with which it is digested, and its consequent value as a restorative. The observation that doctors never take their own medicines, does not apply in this case, at least.

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THE

BACTERIOLOGICAL WORLD

AND MODERN MEDICINE.

VOL. I. BATTLE CREEK, MICH., U. S. A., NOV. AND DEC., 1892. NO. 13.

ORIGINAL ARTICLES.

STUDY OF IMMUNITY.

BY M. METCHNIKOFF.

VI. THE RESISTANCE OF RABBITS TREATED WITH SERUM.

It remains for us to examine the phenomena taking place in the organism of the nonvaccinated rabbits which resist the virulent infection, by treatment with the serum of vaccinated rabbits.

Let us inject 0.25 c. c. of very virulent blood under the skin of the ear of a rabbit, having just received in a vein 3 c. c. of preventive serum, and let us make an injection of the same virulent blood under the skin of the ear of a witness rabbit, not treated by the serum. A few hours later a little exudate is withdrawn from the point of inoculation of the two rabbits; this exudate contains very few leucocytes, but contains an enormous mass of microbes of hog cholera; the witness dies 9 hours and 25 minutes after the injection. The vessels of the ear are greatly congested; a drop of exudate withdrawn is troubled, but there are in it no leucocytes, only an enormous mass of microbes.

As in this case the action of the microbe has been very rapid (after subcutaneous injections the rabbits usually die only after 24 hours or later), the treated rabbit is injected with 4 c. c. more of the same serum in the vein of the sound ear. The rabbit becomes manifestly sick; the congested ear becomes œdematous. The liquid exudate contains masses of the bacteria of hog cholera and a certain number of leucocytes, all of which are full of microbes.

The next day the rabbit begins to improve. The œdema of the ear contains a troubled exudate in which you will find besides a mass of bacteria of hog cholera, many leucocytes, a large number of which contain microbes easily stained by methyl-blue. In order to know in what state the bacteria are at the beginning of the healing, the exudate containing already numerous phagocytes, I have injected three drops of this liquid under the skin of the ear of the new rabbit. This rabbit died in 15 hours; this proves that the bacteria, a number of which are already englobed (but the majority of which we find free in the exudate) were very virulent.

Forty-eight hours after the beginning of the experiment, the ear of the rabbit contained a thick exudate, voluminous enough, composed of a mass of leucocytes, but in which no bacteria were found with the microscope, neither in the exterior nor the interior of the phagoctyes. But still this pus contained some virulent microbes. Injected under the skin of the ear of the new rabbit, they cause death in 51 hours and 30 minutes, with typical symptoms, and the blood contained an abundance of bacilli of hog cholera.

This experiment demonstrates clearly that the cure was produced, not by bactericide or attenuating humors, but really as a result of the intervention of the phagocytes having englobed the bacteria, and thereby preventing their normal action.

The bacteria of hog cholera treated with preventive serum, provokes a local suppuration, which persists a long time, just as in vaccinated rabbits.

This pus contains equally, during a long time, bacteria, in which a virulence can be easily demonstrated.

An emulsion in a physiological solution of NaCl, of the sub-cutaneous pus of the rabbits which escaped death, owing to the treatment by preventive serum, provoked

in new rabbits fatal hog cholera, even when taken 13 days after the inoculation of the virus; the pus injected in the vein of the new rabbit produced death in 20 hours, with all the signs of hog cholera.

The rabbits treated by preventive serum contain, then, for a long time, in the phagocytes of their pus, microbes still virulent, which condition does not prevent them from keeping a normal temperature and of feeling perfectly well. It is not therefore owing to the bactericide or the attenuating property of the humors that this result may be obtained. We can the less invoke an antitoxic property; for as we have seen in Chapter IV, the serum of the rabbits preserved by the serum of the vaccinated cases does not even exert a preventive influence. Furthermore, we have seen that the antitoxic property is wanting even in rabbits vaccinated with toxines and possessing a very high degree of preventive power in the serum. *It is not, therefore, the microbe which is modified by the action of the preventive serum, but it is the treated organism.* From all the facts exposed we can draw the conclusion that the preservation of the rabbits not vaccinated or treated with serum is due to the superior activity of the phagocytary defense. We may therefore express the supposition that the *preventive serum, as in the example of hog cholera in rabbits, acts as a stimulant to the phagocytes, in rendering them less sensible to toxines, and exciting them in their fight against bacteria.*

VII. CONCLUSIONS.

First, The serum of rabbits vaccinated against hog cholera does not present bactericide or antitoxic properties.

Second, This same serum does not possess the power of attenuating the virulence of the microbe of hog cholera.

Third, Notwithstanding the absence of these three properties, the serum of the vaccinated rabbits protects the new rabbits against mortal infection by the bacteria of hog cholera.

Fourth, This preventive property is not found again in the liquid of the œdema provoked by the stopping of the circulation.

Fifth, The bactericide property of the organism of the vaccinated rabbits resides in the phagocytes.

Sixth, The pus of vaccinated rabbits retains during a long time some virulent microbes.

Seventh, The organism of vaccinated rabbits is very sensible to the toxines of hog cholera, and does not present any antitoxic property.

Eighth, The phagocytes play a very important role in the resistance of vaccinated rabbits.

Ninth, The phagocytes play equally a very important role in the resistance of nonvaccinated rabbits or those treated with preservative serum. It is probable that these exert, in these conditions, a stimulating influence on the phagocytes.

THE NEW CHEMISTRY OF THE STOMACH

BY J. H. KELLOGG, M. D.

(Concluded.)

In my studies of digestive fluids, I do not confine myself to a determination of the quantity of chlorine present in its different forms, but also employ the various color reagents, and also the well-known tests for peptones, propeptones, and albuminoids, the coagulation test for rennet ferment and for the rennet zymogen, and also determine the state of the starch digestion by means of Lugol's solution. Tests are also made for lactic acid, as well as for acetic and butyric acids, and for bile and alcohol when the presence of these substances is suspected. Important facts are also ascertained from an ocular examination of the stomach fluid, from a determination of its quantity and the amount and appearance of the residue left on the filter. On the next page is a reproduction of the blank form which I have prepared for use in my own laboratory, and which I find very convenient, as it shows at a glance all the more important things relating to the work of the stomach which it is possible to know.

I also sometimes employ salol for determining the state of the motor function of the stomach, and iodide of potash for ascertaining the rate of absorption; but I find so great a discrepancy in the results obtained by these methods that I cannot but consider them as of less value than the information derived by other means, especially clapotement and the stomach-tube.

NO.....

SANITARIUM LABORATORY OF HYGIENE.

BATTLE CREEK, MICH.

J. H. KELLOGG, M. D., Superintendent.

ANALYSIS OF STOMACH FLUID.

M.....189..

Test-meal. Bread, fermented, unfermented.... oz., meat, eggs....oz. Water, 8 oz. Breakfast. Dinner. (Lavage two hours previous.) Duration of Digestion.....hours minutes.

Physical characteristics: amount.....c.c., color..... odor.....blood.....mucus.....residue gms.

Normal variations.*

Total acidity, (A)....gms. (A')....	gms. (.180-.200 gms.)	
Coefficient, (*a*).....	(.86)	
Total chlorine, (T).....	gms. (.300-.340 ")	
Free HCl, (H).....	gms. (" ")	(.025-.050 ") } .180-
Combined chlorine, (C)..	" (" ")	(.155-.180 ") } .225.
Fixed chlorides, (F).....	" (0.109 gms.)	

Color reactions for HCl: Congo-red...Methyl-violet.....
Günzburg's reagent.....Resorcine.....Dried residue.....

Reactions for fatty acids, etc.: Lactic.....Acetic or Formic Butyric. Bile.....Alcohol.....

Digestion of Proteids: Biuret reaction.....purple, violet
Rennet ferment.....Rennet zymogen.....

Digestion of Starch: Lugol's solution..blue, brown, violet, purple.

Diagnosis. Formula: A *a* T $\left.\begin{matrix} H \\ C \end{matrix}\right\}$ +

.....

Prescription.....

.....

* The quantity of chlorine is expressed as HCl. The values given relate to 100 c.c. of stomach fluid.

As regards the treatment of the various conditions with which we are made acquainted by a careful chemical investigation of the products of digestive work obtained from the stomach when in full activity, I have scarcely space in this paper to do more than simply call attention to the fact that the requirements of each individual case are by this method so clearly defined, and so explicitly indicated that there can be no doubt as to what needs to be done. After obtaining the data furnished by the chemical investigation, noting also the quantity of the fluid withdrawn, one has but to make a formula to be enabled to see at a glance what are the therapeutic indications in the particular case. For example, if in a given case the formula found is $A + a + \left.\begin{matrix} H + \\ T + C + \end{matrix}\right\} +$, the fact is discovered instantly that the case in hand is one of hyperpepsia with hyperhydrochlorie, hyperacidity, and acid fermentation. Whether or not the hyperacidity is or is not due to acid fermentations alone, can be ascertained by determining the value of A', which should always be done whenever we find $a +$. If A' is above normal, then we have hyperacidity due to hyperhydrochlorie, and to this is superadded the acidity resulting from acid fermentation. If the acidity resulting from acid fermentation is very considerable in amount, and especially if the quantity of fluid drawn from the stomach is large, we know at once that the first measure to be employed in the case, unless strongly contrary-indicated by some other pathological condition, is lavage. It is surprising indeed how quickly acid fermentations may be suppressed by simply washing out the stomach, at the same time so ordering the patient's dietary as to avoid the introduction of a new supply of microbes, in other words, employing an antiseptic diet.

The superiority of a method which determines, quantitatively, the amount of chlorine present in the stomach fluid, and the exact amount of chlorine present under the several conditions in which this element is found in the stomach fluid, is well shown by the following case :—

The patient (Case 68), a married lady about fifty years of age, had suffered for many years from stomach disorders more or less pronounced. The quantities obtained after the test breakfast were as

follows: (A), .272; (A′), .251; (*a*), .96; (T), .384; (H), .058; (C), .224.

The color reactions were as follows: Congo-red indicated the presence of free acid. Methyl-violet gave only a very slight reaction, indicating a very small amount of hydrochloric acid in a free state, notwithstanding the fact that it was present in excess. Uffelmann's reagent gave a very slight reaction, indicating the presence of lactic acid in only a very small amount.

It is evident that without the quantitative chemical analysis in this case, the real nature of the case could not have been understood. The slight indication of the methyl-violet reaction would suggest that the excessive acidity was due to the fermentation, which would be considered as confirmed by the reaction for lactic acid, as this reaction is known to be more or less uncertain, and not at all reliable as an indication of quantity. The determination of the actual quantities of chlorine present, however, shows us that the amount of fermentation is very slight, *a* being normal at .86, and that the quantities of free HCl (H) and combined chlorine (C) present, are sufficient to give an acidity of .251, the significance of which is readily seen by comparing these figures with the normal limits, .180 and .200.

In the following case, the same point is illustrated, and an additional one of fully equal importance: —

The patient, a married lady of 35, was a chronic dyspeptic. Sixty-nine c.c. of stomach fluid were obtained after a test meal, in which a considerable amount of mucus and residue were found. Analysis gave the following quantities: (A), .320; (*a*), 1.35; (T), .340: (H), .074; (C), .182.

Congo-red indicated the presence of free acid, but methyl-violet gave only a very slight reaction. Uffelmann's reagent gave a slight reaction for lactic acid. If the color reagents had been relied upon without the quantitative analysis, this case, as the other, might have been regarded as a case of excessive acidity due to fermentation alone, whereas there is not only fermentation but also hyperpepsia of a very considerable degree, as is readily seen by comparing the figures given with the normal, both the combined chlorine and the free HCl being .025–.050, and the value of A′ being found considerably above normal, namely .231. A great amount of fermentation is also shown to be present, as indicated by the high value of *a*. This is a case of hyperpepsia with acid fermentation. By no other known means could the exact conditions present in this case have been accurately ascertained.

In the cases mentioned above, the fermentation was quickly suppressed by lavage, aseptic diet, and antiseptic medication, and the patient made rapid and marked improvement.

The following summary relating to other data than that pertaining to the chlorine of the gastric fluid may be of interest: —

Sex.—Of the whole number of cases examined, 30% were men and 70% women. The proportion of males to females found in each of the three great classes of dyspepsia is as follows: —

In hyperpepsia the proportion was found to be, for males, 34.6%; females, 65.4: in hypopepsia, for males, 24.8%; females, 75.2%: in simple dyspepsia, for males, 26.5%; females, 73.5%. It thus appears that men are more susceptible to hyperpepsia than are women, while hypopepsia is the most common form of stomach disorder in women.

Digestion of Proteids.— Out of 261 cases, peptones were abundant in 183; reaction for peptones was feeble in 32 cases, and absent in 44 cases. The test for albuminoids was also absent in 11 cases.

The rennet ferment was present in abundance in 77.1%; was entirely absent in 13.8%; was present in the form of zymogen in two cases in which it could not be detected in the form of rennet; and was entirely absent as rennet or zymogen in 7.6% of the cases.

Starch Digestion.—In 149 cases in which starch digestion was especially studied, the purple color of acrodextrine was found in 67.8%; the digestion of starch shown by the blue color was present in 2%; good digestion of starch, shown by brown coloration, in 17.4%, and complete digestion, indicated by no reaction, in 2% of the cases.

Quantity of Fluid Obtained. — The normal quantity of fluid is 40 c.c. Eighty to 100 c.c. was found in 32.3% of the cases, and more than 100 c.c. in 67.7%.

Residue.— Residue was found to be less than one fourth of the entire quantity

of fluid withdrawn in 20.7%, more than one fourth and less than one half in 62.9%, and more than one half in 16.4% of the cases.

Mucus.— Mucus was present in considerable quantity in 45.1%, in very small quantity in 46.3%, and absent in only 8.6%, indicating very clearly the the relation of stomach catarrh, or excessive secretion of stomach mucus, to cases of dyspepsia, so-called.

Lactic Acid.— Lactic acid was in excess in 34.2%, diminished in 23.5%, and absent in 46.5%.

Dilatation of the Stomach.— Dilatation of the stomach was observed in 42% of the cases.

Hyperæsthesia of the Sympathetic Ganglia.— Hyperæsthesia of the solar plexus of the lumbar ganglia of the sympathetic was present in 29.6% of the cases.

Kidney Displacement.— Mobility or displacement of one or both kidneys was found in 14.6% of the cases.

It would also be of interest to study the relation of the various data presented to the several classes, groups, and subgroups of dyspepsia, but this study must be deferred for a future paper.

The excess of free hydrochloric acid, and of the total chlorine, indicates usually a glandular irritation resulting in excessive secretion. Not uncommonly there will be found great hyperæsthesia of the solar plexus, the lumbar ganglia, and sometimes other portions of the abdominal sympathetic, the relation of which to functional disorders of the stomach is a matter of great interest, but of too large proportions to be considered in this paper. This glandular and nervous hyperæsthesia or irritability must be lessened by the employment of an appropriate dietary, soothing remedies, such as subcarbonate or subnitrate of bismuth, galvanism, and the various resources of hydrotherapy adapted to such cases. By the aid of massage, skillfully administered, the relaxed stomach may be emptied of its contents before fermentation has become far advanced. By these and other means the return of the stomach process to a normal channel may be facilitated, and generally the *vis medicatrix naturæ* is competent to restore to a normal state the vital activity of the stomach when favorable conditions are applied, so that the patient quickly experiences wonderful relief; and the satisfaction afforded to the doctor by the gratitude of his patient is ample compensation for the painstaking investigation required to put him upon the right track.

The chart which I present with this paper exhibits a classification of all the different forms and types of dyspepsia which I have encountered in a careful study of 340 analyses, and shows at a glance the therapeutic indication of each form. The best means of meeting these indications may not be in all cases known to us at present, although the results which I have obtained are such that I do not feel any hesitancy in saying to any patient whose stomach disorders are clearly functional, that he may confidently expect relief within a reasonable length of time by the employment of the rational measures with which we are acquainted, and which the precise knowledge afforded by the accurate means of investigation enable us to employ with far greater satisfaction and success than heretofore. We have long been possessed of abundance of artillery and ammunition with which to fight the hydra-headed disease, dyspepsia, which is perhaps responsible for more human ills and woes than any other malady; but our efforts have been often fruitless because we were obliged to aim our artillery without precision, like firing at an enemy concealed in a fog-bank.

The new light which has come to us through the brilliant results of the labors of the eminent French physiologists, who have given to us the new method of analysis described in this paper, illuminates this subject with the light of a noonday sun, and renders interesting — I may even say fascinating — the study and treatment of a class of disorders which have been heretofore so disappointing, and so baffling as to render to many physicians the very sight of a chronic dyspeptic, obnoxious and repulsive. Although for twenty years my professional work has been done under such circumstances as to bring me in contact constantly with a very large number of obstinately chronic cases belonging to this class of sufferers, I confess I have fully shared the sentiments above expressed, with my medical brethren, and have only really experienced genuine satisfaction — I may almost say delight — in meeting an old dyspeptic, since I have based my

treatment of these cases upon positive facts furnished by a rigid chemical investigation, instead of trusting to hypothetical theories, intuition, or even experience, which is a dear school to learn in,—at least for our patients,—and unfortunately teaches wrongly almost as often as rightly. No therapeutic experience could be more interesting than to watch a bad type of indigestion gradually rising from the lowest depths of hypopepsia through the various degrees of this morbid state, by and by reaching simple dyspepsia, or some attenuated form of hyperpepsia, and finally assuming those normal characters which indicate a restoration to perfect health. The only possible objections that can be raised to this investigation of stomach disorders is the fact that it is inconvenient for both patient and physician. I have found, however, without a single exception, that patients who have long suffered the pangs of chronic dyspepsia, are very ready to submit to the slight inconvenience accompanying the skillful passage of a small stomach tube, and many patients find the operation so little disagreeable that they are inclined, from curiosity to learn what progress they are making, to desire the passage of the tube too frequently. By a general and skillful use of the tube, it is possible to employ it without serious difficulty on the most delicate patients, and even children.

As regards the inconvenience to the physician, I cannot speak so encouragingly, for nothing short of a very thorough, painstaking, and most exact chemical investigation is of the slightest value. Indeed, the information afforded by a careless investigation might be most unfortunate and damaging by giving a wrong direction to the treatment. The most precise chemical methods and the most exact and dexterous manipulation will alone give satisfactory results. A mere qualitative analysis is of no value whatever, as has already been shown. An exact quantitative determination of the chlorine in its several states must be made. For this, a properly equipped laboratory and a skilled chemist, or at least one who is skilled in the particular methods required in quantitative analysis, are requisite. The time required for the careful examination of a single specimen of the stomach fluid is from three to five hours. Much of this time must be consumed in filtration and evaporation, and so three or four specimens can be examined at once without much increasing the time spent. It must not be imagined, however, that when an analysis has been made and the diagnosis and therapeutic indications worked out, all has been accomplished that a stubborn case requires. It is often necessary to make repeated analyses, varying the character of the test meal and the time of the digestion. Above all it is necessary that a careful dietetic prescription shall be made, and that the patient shall be made to carry it out. The difficulties in the way of inducing the patient to take the dietetic part of his prescription, are sometimes very great, but the thing must be accomplished, even if it becomes necessary to send the patient away from home to some place where his dietetic needs may be supplied, or to hire a special cook or nurse to supervise his dietary. At whatever cost, the thing must be done, and not in a half-hearted way, but most thoroughly, or the effort will be fruitless.

I find that patients are always deeply interested in the results of the chemical investigation of the stomach fluid, and a careful physical examination of the stomach by clapotement and other means. Patients who have long suffered from stomach disorders recognize at once the value of this mode of investigation, and are very ready to bear uncomplainingly the slight inconvenience of the method, feeling that an effort is being made to reach the root of the difficulty which has occasioned them so much discomfort and suffering. The ability to represent graphically by a formula the exact condition of the digestive process in a given case, and to determine mathematically the extent of deviation from the normal condition, relieves the subject of functional disorders of the stomach from the mystic vagueness with which it has been surrounded heretofore, and illuminates every case thus investigated with a light which renders the study really a fascinating one to both patient and physician. The graphic character of the method and its exactness have suggested that it might be termed the "algebra of the stomach." Certainly no algebraic problem could be more interesting than are the problems in the digestion which this method enables one to solve readily, and with a high degree of precision.

In my own experience, I think I have demonstrated that most of the therapeutic indications encountered in functional disorders of the stomach may be fully met by careful and intelligent regulation of the diet with the aid of the information afforded by the chemical investigation of stomach fluids. There is still, however, a great dearth of knowledge respecting the dietetic properties of various food substances and preparations. The observations of Beaumont upon the stomach of Alexis St. Martin afford about the only reliable information possessed by the profession at the present time; but unfortunately, this ingenious investigator was unacquainted with the facts which have been developed by modern physiology, and especially by bacteriology, and hence his observations were necessarily crude and his results conflicting and uncertain. As a matter of fact, we know almost nothing about the digestibility of foods or the special therapeutic values of different food substances. I am now engaged in an extensive series of experiments upon healthy persons, which I trust will afford definite and positive information, since the exact chemical methods which we now possess enable us to study the digestive process in all its stages with nearly the same precision that the assayer studies the handful of crude ore brought him by the prospector, and with results as brilliant as those which sometimes reward the mine hunter among the mountains of the West.

The results of my studies, together with an outline of the methods of treatment which I have found successful in the management of functional disorders of the stomach, I shall make the subject of other papers.

CONTRIBUTION TO THE STUDY OF PROGRESSIVE MUSCULAR ATROPHY.

BY W. H. RILEY, BATTLE CREEK, MICH.
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(Continued.)

In the onward progress of the disease, parts first affected become more and more wasted until there may be a total absence of muscular tissue, while new territory is being constantly invaded by the morbid process. Bony prominences are made bare. Joints become relaxed and loose, and in some cases dislocations occur. On account of the unequal affection of antagonistic muscles, deformities not infrequently result. The claw-like hand has already been referred to. There may also be deformities about the hip and shoulder joints.

When the arms are the seat of much wasting, the lower limbs may be normal, or the muscles may be soft, flabby, and slightly wasted. As the disease progresses, the changes in the lower limbs are soon as great as those in the upper, and in extreme cases, the wasting is quite as great in one part of the body as another.

There is another class of cases in which the appearance of the lower limbs is quite different from the above. These have frequently been classed by themselves as a separate disease, under the head of *amyothrophic lateral sclerosis*; but as we shall presently see, from a pathological standpoint, there is not enough that is different in these cases to require a description under a separate head. In these cases the disease usually affects the cervical region of the spinal cord, producing a decided paralysis and wasting of the muscles of the upper extremity, especially about the shoulders, while in the lower limbs the appearance is quite different; the legs are weak; the muscles are somewhat hard and spastic; the reflexes, deep and superficial, are increased; the patient has a stiff, awkward gait, steps short, with a tendency to scrape toes, and does not raise his feet far from the ground. This spastic condition of the muscles, while well marked, does not reach that extreme degree that is commonly seen in spastic paraplegia. In this class of cases there are not the usual electrical changes in the muscles of the legs that we find where wasting is present. There may be some slight diminution of irritability to faradic and voltaic currents, or the electrical irritability may be normal. The comparative strength of the muscles of the upper and lower extremities in these cases is illustrated by the chart.

The normal irritability of the muscles and nerves to electrical stimuli is usually changed. These changes differ according to the nature, extent, and rapidity of pathological changes in nerve and muscle. There is no one rule of electrical reaction that will apply in all cases. In order to appreciate and rightly interpret whatever

deviation there may be from the normal, one must keep clearly in mind the action of the motor nerve and muscle when stimulated by a faradic or voltaic electrical current in a healthy condition, and the necessary pathological changes in nerve or muscle, or both, to bring about any particular change in their electrical irritability. Both nerve and muscle in a healthy condition respond when stimulated by the faradic or voltaic current. When a healthy motor nerve is stimulated with a secondary current of the faradic machine, it produces a continuous or tetanic contraction of the muscles supplied by the nerve. If single isolated shocks are sent into a nerve, a single contraction of the nerve results. When a voltaic current of ordinary strength passes through the nerve, there is no contraction during its passage, except at the "make" and "break" of the current. A contraction may result, if the current strength is suddenly increased or decreased during its flow without an actual "make" or "break."

When the faradic or voltaic currents are applied directly to a muscle in a healthy condition, a contraction of the muscle results, but the contraction is not as great as when applied directly to the motor nerve which governs the muscle. In either case the muscle is brought into activity by the electric stimulus acting through the nerve. The contractions are greater in one case than the other, because the nerve is more directly stimulated. It is a fact, however, that the muscles themselves are irritable to electrical stimuli without the intervention of the nerve.

If the nerve be destroyed by the action of curare, or by section, or by disease such as inflammation, so that its influence is entirely removed from the muscle and the muscle itself directly stimulated by the faradic current, a contraction is the result; but the contractions under these circumstances are not as great as when the same strength of current reaches the muscle by acting through the nerve, and in a short time, a few days at most, no contractions at all can be produced with the faradic current.

If the muscle under similar circumstances be stimulated with the voltaic current, it will be found to contract as readily or more readily than when the nerve is intact. At first, when the influence of the nerve is removed from the muscle, the response is about the same as under normal conditions, except that the contractions are somewhat slower; but very soon the irritability of the muscle to the voltaic current increases so that the contractions are produced with a much weaker current than normally. This absence of faradic irritability with increased voltaic irritability is due to certain nutritive changes taking place in the muscle.

Now with the disease under consideration, there is, as we shall presently see, a degeneration of motor nerves as well as wasting of muscles, and with this degeneration there is a diminution of irritability of nerve to both faradic and galvanic currents. If the changes in the nerve are slight, there may be scarcely any deviation from the normal in the electrical reactions; but if the nerve is entirely destroyed, there will be no response on the part of the muscle when the nerve is stimulated.

The reaction of the muscles varies with the nutritive changes taking place in them, and these in turn depend on the extent of degeneration in the nerve. When the degenerative changes in the nerve occur rapidly, there may be a total absence of irritability of the nerve to the voltaic and faradic currents, while the irritability of the muscle to the voltaic current may be normal or even increased. The quality of the voltaic irritability may also be normal, but sometimes the anodal closure contraction occurs as readily as the cathodal closure contraction, A. Cl. C. = C. Cl. C.

When the wasting is slow, there is usually diminution of irritability to both faradic and galvanic currents. As the muscular nutrition fails, so does their irritability; and in cases where the wasting is great, only slight contractions may be obtained. When the wasting is extreme, no contractions can be produced at all with either current. At one end of a series of electrical charges there may be a total absence of faradic irritability in both nerve and muscle, with increased voltaic irritability, and qualitative changes in the muscle; at the other end, simply a diminution of both faradic and galvanic irritability in nerve and muscle; and between these two extremes there may be many shades of variation.

Fibrillary contractions are frequently a prominent symptom throughout the dis-

ease. They occur as a contraction of a bundle, or more often a few muscular fibers, now here, now there, each contraction being momentary in its duration, to be quickly followed by a similar manifestation in some other part. These usually occur spontaneously, but may be easily provoked by a slight tap, by exposure to air, by passive and active movements of the muscles, or by slight electrical stimulation. They may frequently be seen in a part which is later the seat of the more serious symptoms of wasting and paralysis. Usually they are present throughout the disease; and when once present in any particular part, usually remain until the total atrophy of the muscles causes their disappearance. While this symptom has a prominent place in forming the picture of the disease, it by no means belongs to this disease alone.

In those parts that are the seat of the characteristic wasting, all reflex action is abolished, and this on account of the damage done to the motor cells and motor fibers which constitute the efferent portion of the reflex arc. The afferent portion of the reflex arc is unaffected. We shall presently call attention to the normal condition of the posterior root fibers and the posterior columns of the spinal cord, and as we shall see, there is no loss of sensation.

The tendon reflex action is lost in those parts that are later the seat of wasting, even before the wasting is apparent. In these cases where there is paralysis of the lower limbs without wasting, the reflexes may be present, in fact are usually exaggerated, but in these cases the paralysis is caused by damage to motor fibers for the legs in the upper segment of motor path, while the lower segment, which forms the efferent part of the reflex arc, is little damaged or remains unaffected.

The sensory symptoms are usually slight, and may be entirely absent. Usually there is no pain. Sometimes, however, especially at the beginning, there may be neuralgic pains in the part that is later the seat of wasting and weakness. There may be rheumatic pains, more or less severe, felt in the limb and joint, usually where the disease is most severe. Feelings of "numbness" and "deadness" are sometimes complained of, but cutaneous sensibility as a rule is not impaired. The patient is able to recognize impressions of touch, pain, and temperature, when applied to the skin, quite as readily as in health. The sensibility of the muscles is also retained. The patient is able to recognize changes in posture.

Occasionally one sees cases where the disease begins in the muscles of the shoulder and upper arm, where severe pain in the early history of the disease is a prominent symptom. The weakness of the muscles that follows in a very short time is extreme in degree. The disease runs a rapid course, and in a few months, or a year at most, death is the result.

Along with the wasting of the muscle there is, usually, a loss of adipose tissue and a slow but gradual loss of weight. At the close of the disease, in these cases where less important parts are affected, the emaciation is so great that very little muscular tissue is left on the bony skeleton. The atrophied limb is cold, and may be pale or livid, but usually there is no acute vaso-motor disturbance.

The sympathetic is, as a rule, not involved. Dilatation or contraction of the pupil has been observed chiefly in cases where the cervical cord was involved, and no doubt was due to disease of the spinal cord and not the sympathetic. The visceral functions are usually not disturbed. There may be some slight digestive disturbance, with constipated bowels. The sphincters rarely suffer. Occasionally they do, more especially in those cases where the wasting is extreme in the lower limbs. There are certain changes in the composition of the urine. My own observations have been that the amount of urea gradually decreases during the progress of the disease, and in one case was one half the quantity at death that it was a few months before. On the other hand, phosphates and oxalates of lime were increased. These observations seem to agree quite closely with those of Gowers and Fromman.

As a rule, the temperature remains normal during the progress of the disease. In the later stages of the disease, where the muscles are breaking down rapidly, the temperature may rise to 100° or 101°, but it will seldom remain here.

The heart, as a rule, is not involved in the early history of the disease; but in the later stage, when the patient becomes much emaciated, the pulse may be very rapid and weak, and may reach 120 beats per minute.

(To be continued.)

TRANSLATIONS AND ABSTRACTS

[THE articles in this department are prepared expressly for this journal.]

THE GLYCOGENIC FUNCTION OF THE LIVER.

BY DUJARDIN-BEAUMETZ.

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Translated by J. H. Kellogg, M. D.

IN 1848, Claude Bernard published his first experiments, which he continued during many years. Claude Bernard established the glycogenic function of the liver by means of many demonstrative experiments. He began by analyzing the hepatic tissue, and finding in it the presence of sugar in the proportion of one to two per cent. Then he analyzed the blood which entered into the liver, and that which escaped from it, and he found that while the blood in the portal vein contained no glucose, that in the hepatic vein always contained it. He showed, then, that there is a special body contained in the liver which furnishes this sugar, and that this substance persists after death, of which he obtained positive proof by passing a current of water through the liver and finding it to be charged with glucose. Claude Bernard gave to this substance which he had isolated, the name of glycogen. Glycogen is isomeric with starch; it has for its formula $(C_6H_{10}O_5)+H_2O$. This formula is that of inuline and amylo-dextrine. This analogy led Bernard to give to glycogen the name of animal starch. It has also been called hepatine and Bernardine. It can be isolated as a white powder, which swells in contact with water, like starch. These bodies, in the presence of diastase, are transformed into achroo-dextrine and starch.

The quantity of glycogen in the hepatic tissue is variable. It has been found in so great a proportion as 13 to 17 per cent. It is also found in the muscles, in the white globules, and in embryonical tissues.

But this animal starch requires a ferment which is found in the hepatic cells. These, Claude Bernard has also isolated by means of alcohol.

The production of sugar in the liver may be thus divided into two acts: —

1. The manufacture of glycogen from the glucose and peptone absorbed; and —

2. The transformation of the starch into glucose.

These two acts have for their object the maintenance in the blood of a given quantity of sugar which may be fixed at one or two parts to 1000. This sugar is burned in the different vital acts of the body, and by its combustion serves to maintain animal heat.

The liver thus acts as a regulator by means of its glycogenic function. It stores the glucose under the form of glycogen, ready to throw it into the blood at any moment when it may be deficient in quantity. When the quantity of sugar in the blood becomes too great, as when the proportion becomes two and one half parts per 1000, it escapes in the urine, and glycosuria appears.

Where do these two physiological acts occur? — In the hepatic cell itself; and when this is destroyed, the double function disappears, from which fact important conclusions may be drawn relating to the pathology of diabetes.

It was not sufficient for Claude Bernard to have shown the glycogenic role of the liver. He studied also the influences which modified this glycogenic function. It is upon this that I shall particularly dwell, as of the first importance from a clinical point of view. As the glycogenic functions of the liver are increased, or combustion of the glucose thrown into the blood diminished, the proportion of two and one half parts of sugar per 1000 parts of blood is exceeded, and glycosuria appears. That is a pathological condition which must be combated.

One of the most important influences which affects the glycogenic function of the liver, is the nervous system. Claude Bernard showed that there existed upon the floor of the fourth ventricle, a point which controls the glycogenic function, and that an experimental diabetes may be produced in animals by the puncture of the fourth ventricle. Before we had acquired a knowledge of pancreatic diabetes, this was the only method employed in the laboratory for the experimental production of glycosuria in animals. Unhappily this experiment gives no information of therapeutic value, because the glycosu-

ria thus produced in animals is temporary in character, the animal recovering at the end of a few days.

We have no very clear explanation of this action of lesions of the floor of the fourth ventricle upon the glycogenic functions of the liver; but that this action is real, has been demonstrated by an experiment of Winogradoff, who showed that in frogs deprived of the liver, this nervous lesion did not produce glycosuria. It is probable that these lesions of the nervous system act in producing glycosuria by modifying the hepatic cell itself, and the nutritive conditions which control them.

The same is true of diabetes resulting from injuries of the brain, so that there is a distinct group of glycosurias of nervous origin. It is due to the physiological action of the liver as a regulator, that a percentage of glucose in the blood is maintained at the constant point of two parts to 1000. Two circumstances may modify this equilibrium: —

1. The liver may produce too much sugar.

2. The amount of sugar consumed by the system may be insufficient.

In the first group are to be found those cases which have been described under the name of dietetic glycosuria: The man or the animal takes too great quantities of glucose, resulting in an excess of sugar in the blood, of alimentary origin. I should remark that it is exceedingly difficult to increase the amount of sugar in the blood of a perfectly healthy animal.

In the experiments which I have made with respect to the diuretic properties of glucose, which you will find described in the thesis of one of my students, Mme. Sophie Meilach, I have found it necessary to give rabbits 70 grams (2⅓ ounces) of sugar per kilogram of body weight, to obtain alimentary glycosuria.

Dietetic glycosuria occurs under the influence of various predisposing causes; and very frequently, by submitting the animal to special diet for a long period, the glycogenic function of the liver will be suppressed.

Diabetes is sometimes due to the fact that sugar is not burned in the system. Asphyxia produces this condition. Diabetes due to poisoning is explained in the same manner as is that due to the administration of ether, chloroform, and certain drugs, such as mercury, morphia, chloral, etc. These substances modify the blood in such a manner as to prevent the destruction of sugar, and thus occasion its accumulation.

Among the drugs which produce this toxic glycosuria, should be mentioned phloridzin. This drug, introduced by subcutaneous injections, or by the stomach, produces in animals an intense glycosuria, which continues as long as the drug is administered. However, it should be remembered that this is an experimental form of diabetes, which may be produced without any modification of the liver, since a frog deprived of its liver becomes diabetic under the influence of this drug. It is probable that phloridzin, which is a glucocide obtained from the roots of certain trees, the pear, the apple, and the cherry, is transformed in the system directly into glucose without the intervention of the liver or of the pancreas.

This question of toxic hyper-glycæmia brings us to the study of pancreatic diabetes. I have shown you that the liver throws into the blood a given quantity of glucose. This quantity, according to the figures of Bouchard, is very great, amounting to nearly two kilograms, or 1850 grams (a little more than four pounds), in twenty-four hours.

This quantity of glucose is burned by respiration and muscular activity, but a portion is also destroyed by the blood. The sugar-destroying property of the blood, has been termed its glycolitic power. Lepine and his pupils have made the glycolitic power of the blood the subject of a series of communications, since 1889, which have clearly shown the power of the blood to destroy sugar. They have shown that this glycolitic power of the blood is due to a ferment which is present in the blood corpuscles, and which is produced in the pancreas, which explains so-called pancreatic diabetes.

In 1877, our colleague and friend Lancereaux showed that the grave forms of diabetes, to which the name *diabetes maigres* (diabetes accompanied by emaciation) has been given, are accompanied by more or less pronounced lesions of the pancreas. The frequency of these alterations in cases of grave diabetes is such that the name *pancreatic diabetes* has been given to them.

In his communication, Lancereaux calls attention to known facts respecting alterations in the pancreas, accompanying gly-

cosuria, and he showed that the first of these observations dated as far back as 1789, having been made by Cowley. This fact of pathological anatomy was verified by further investigation, the results of which we find presented in the thesis of a student of Lancereaux, Dr. Lapierre, which appeared in 1879. In 1881, Baumel, of Montpellier, published some observations upon diabetes accompanied by emaciation, and even by diabetes without emaciation, with lesions of the pancreas. This pancreatic diabetes, which had been established by clinical observation, was confirmed by the experiments made in 1889 by Von Mehring and Minkowski, who, in studying the functions of the pancreas, showed for the first time that total extirpation of the pancreas produced in animals a sugar diabetes of a most severe type; but this experimental diabetes, in place of being temporary, as that produced by lesion of the nervous system, was permanent, and ended in the death of the animals.

Some years before, experiments upon the pancreas had been attempted, but these experiments had given very contradictory results, in consequence of the difficulty of the operation and the disorders produced by it, which rapidly killed the animals operated upon.

The experiments of Von Mehring and Minkowski showed the experimental fact without seeking an explanation. Since that time, these experiments have been often renewed. Hédon, of Montpellier, practiced total extirpation of the pancreas twenty-three times. In the first ten attempts, the animals died as the result of the operation; but by making first a partial operation, then completing it eight days later, removing, first the head of the pancreas, then the remainder, the animals survived the operation. In all these cases in which permanent diabetes was established, the animals became voracious, and lost flesh rapidly. Partial extirpation of the pancreas does not produce diabetes, which was claimed by Réali and Renzi, and confirmed by recent experiments.

It remains now to explain these results. To-day, relying upon the experiments of Lepine, and then of Gley and Hédon, we are led to think that the pancreas is a blood-gland, and that it throws into the bloodvessels, though not into the pancreatic canal, a special ferment which gives to the blood the power of destroying the sugar which it contains. This view is still a hypothesis; for it may be asked whether the diabetes may not be the result of injuries to the solar plexus which surrounds the pancreas, or perhaps the disturbances of nutrition produced by the suppression of the pancreatic juice, in consequence of which very rapid emaciation occurs.

However this may be, we must add to disturbances of the liver as a cause of diabetes, lesions of the pancreas. While the liver throws into the blood the glucose necessary to maintain the sugar of the blood at a constant proportion, the pancreas, by the ferment which it throws into the blood, destroys a certain quantity of this glucose; and when this ferment is no longer secreted, there results from this suppression, a hyper-glycæmia which induces glycosuria. In a word, the glycogenic functions of the liver are complemented by the sugar-destroying power of the pancreas.

Neither is the liver the only sugar-producing organ in the body. Other organs, as the muscles, and, according to Rouget, Pavy, and others, many other tissues contain glycogen.

Finally, in the physiological state during lactation, the females of mammals secrete a particular sugar (lactose), which constitutes the mammary lactose which is furnished by a special glycogen fabricated by the epithelium of the mammary glands acted upon by the albumenoid principles of the blood.

Thus, then, there exist, from a physiological point of view, three sources of glycogen in the body: Embryonal tissue, the mammary glands, and the liver, the sugar production by the liver being in part controlled by the pancreas.

The first two are temporary; one exists during embryonic life, before the formation of the liver; the other, in the females of mammals during lactation.

It is to the glycogenic function of the liver, however, that the sugar of the blood is due, and which enables us to explain the hyper-glycæmia which induces a more or less persistent glycosuria.

The terms diabetes and glycosuria are used interchangeably, for the reason that it is very difficult to separate the diabetes from the glycosuria. It has been asserted that glycosuria is only a passing symptom, which may be present even in a state of

the system which is physiological; while, on the contrary, the term diabetes is applied to a pathological condition which is a general malady. I consider this discussion as scholastic and theoretical rather than clinical.

We will first study the theories of diabetes, beginning with the form termed *pancreatic diabetes*. This form of diabetes is still imperfectly known; for, while it is not true that pancreatic diabetes is always a grave disease, one cannot equally affirm that grave diabetes is always due to disease of the pancreas; for fatal diabetes accompanied by great emaciation sometimes occurs without disease of the pancreas. There are also some cases of diabetes accompanied by disease of the pancreas, in which the patients are not always emaciated, but obese.

In the autopsy of cases of diabetes due to disease of the pancreas, we find more or less complete atrophy, cysts, deteriorations of the canal of Wirsung, sclerosis, and other changes, which, however, rarely change the gland; while, on the contrary, in experimental diabetes, it is only the total destruction of the gland which produces the disease.

Notwithstanding this fact, Lepine has shown that in diabetes there exists a diminution of the glycolitic power; that it is this diminution which explains the hyper-glycæmia which induces glycosuria. This diminution in the power of the blood to burn the sugar, may result from the diminution, in the secretion, of the special ferment formed by the pancreas; but this diminution in the power of the system to destroy sugar is also found in hepatic diabetes. Lepine observes the paradoxical fact that the glycolitic power of the blood was sometimes increased, although it was excessively rich in sugar.

Finally, from the experimental point of view, Gaglio has maintained that if, after removal of the pancreas, the thoracic canal is ligated, the experimental glycosuria disappears.

Equally numerous are the theories respecting diabetes of exclusively hepatic origin; Bouchard counted thirty in 1880. This figure is to-day far surpassed. We will not stop to consider all these theories, for they have, from the point of view which concerns us, only a secondary interest. Taken together, the theories of diabetes may be divided into two principal types, the one regards the cause of the disease to be an exaggeration of the glycogenic function of the liver, which throws into the blood more glucose than is necessary to maintain the vital functions; according to the other type of theories, however, on the contrary, the quantity of glucose secreted by the liver remains the same, but there is no complete combustion of the sugar thrown into the blood.

Let us rapidly examine these two theories. The first is the one which was originally maintained by Claude Bernard. Lécorché, and more recently Albert Robin, have presented this view in a new form, maintaining that diabetes results from excessive activity of the tissue metamorphoses, and in his communication to the Academy, Robin, relying upon the analysis of urine, affirmed that in the diabetic there is always an increase of oxidations.

The other doctrine, on the contrary, has been defended by Bouchard, who asserts that diabetes results from the fact that the system cannot burn the sugar thrown into the blood by the liver, and that this default in combustion is itself produced by a diminution in the nutritive functions. So he classed diabetes among the results of lowered nutrition. I should remark that recent theories of pancreatic diabetes approach this view, since Lepine affirms that the cause of diabetes results from a diminution in the power of the blood to destroy glucose.

It is very difficult to pronounce to-day between these two theories, because both of them may be true, for diabetes is not a single disease, it is multiple; and if, in fact, as is true in a great majority of cases when the vitality is lowered or the general functions of the system enfeebled or nutrition impaired, diabetes is seen to make its appearance, it is not less true that other cases are observed in which the disease appears during the period of the development of the body at the age of from fifteen to thirty years. It thus appears to me to be difficult to attribute a common etiology to these two affections so different in their course.

There exist, then, many different forms of diabetes, each of which may have a different etiology, and I am glad to see Lepine, the author of the theory of pancreatic diabetes, adopt this view. "Diabetes," says he, "results from an excess of production of supply of sugar relatively to

its destruction. The disturbance of the equilibrium between the sugar produced (or introduced from the outside) and the sugar destroyed, may be induced in different ways; consequently, there are many species of diabetes."

But that upon which I desire especially to insist, is the necessity of the integrity of the functions of the liver to maintain glycosuria. I have seen many diabetics, and have observed, many times, the following fact: When, in a case of diabetes of moderate intensity accompanied by obesity, thanks to a careful regimen scrupulously followed, the daily production of sugar is lowered below ten grams, a hepatic affection supervenes (infectious icterus, cancer of the liver, cirrhosis), the sugar disappears from the urine, even though the patient no longer follows his dietetic rules. I have made two very close observations upon this point. In one case, an angio-cholitis succeeded by an infectious icterus followed gastro-duodenitis, the patient was subjected to a dietetic regimen consisting exclusively of milk and vegetable foods, in which green vegetables predominated, and the sugar disappeared from the urine. At the moment the obstacle disappeared, that is to say, when the bile re-entered the intestine and the phenomena of icterus disappeared, the same dietary was followed by a reproduction of glycosuria.

In another observation, a fact nearly analogous was observed: the sugar disappeared during a hepatic affection, and reappeared when the patient recovered from the hepatic disorder. It appears to me that we may explain, upon physiological grounds, these observations. In hepatic affections, the glycogenic function of the liver disappears, and with it, the original cause of the diabetes. This also occurs in other affections, even in incurable ones, as cancer and cirrhosis. Cirrhosis has been known to follow diabetes, and the observation has often been made that the immediate use of alcohol, which is quite frequent with diabetics, causes the sugar to disappear from the urine.

I believe that the liver must remain intact in order to maintain the pathological glycosuria in diabetes. It may be objected to this view that lesions of the liver are sometimes found in diabetics, and in numerous autopsies which have been made, hypertrophic cirrhosis and true cirrhosis have been observed. True cirrhosis may be easily explained by the excessive use of alcohol, which is indulged in by most diabetics, who, thanks to the activity of the elimination of the alcohol through the kidneys, are able to take it in large quantities without becoming intoxicated.

Cirrhosis, furthermore, is curative for diabetes, at least in part; for the cirrhotic liver ceases to be glycogenic, and the choking of the hepatic cells by cellulous cirrhosis destroys not only the glycogenic but also the antiseptic and biliary functions of the liver. I have never seen, among a great number of cases of hepatic disease, a single one in which diabetes occurred in the course of a hepatic affection, and I believe it is to-day generally admitted by pathologists that affections of the liver do not produce diabetes.

On the other hand, intercurrent affections of the liver tend to cause the disappearance of sugar in the urine.

Influenza in Russia. — According to the *Medicinische Wochenschrift*, of St. Petersburg, la grippe is much more severe in St. Petersburg than in this country. Last year the influenza raged with such severity among the Kalmuck Tartars, that whole villages were exterminated. These semi-civilized people dread the scourge as much as they do smallpox; and when a person is stricken down with it, he is usually abandoned to his fate.

New Method of Establishing an Artificial Anus. — M. Chaput, of Paris, has suggested a valuable improvement in the method of operating the established artificial anus. It consists in the use of the hæmostatic forceps to connect the intestines and the peritoneum before incising the bowels. The lips of the intestinal wound, the intestine being incised to the extent of half an inch, are stitched to the skin.

A New Method of Anæsthesia. — Dr. Wiesendenger describes a new method of employing cold as an anæsthetic. The essential feature of the method is the application to the part which it is desired to freeze, of a brass tube or other suitable appliance containing liquid carbonic acid gas.

Electrical Anæsthesia.— *La Medicine Moderne* for Jan. 7, 1892, contains the following description of a method of extracting teeth without pain, which is in use at the electrical medical institute of London. We translate as follows: —

"The apparatus consists of a small Rhumkorff coil wound with very fine wire and provided with an interrupter which gives 452 vibrations per second, and constitutes the most important part of the apparatus. The patient places himself in an ordinary dental chair, takes the negative electrode in his left hand, and the positive in his right. The current is gradually increased to the limit which the patient is able to endure. Then the forceps, which are connected with the positive electrode, are placed upon the tooth, and it is immediately extracted and the current interrupted. The patient experiences no other sensation than the prickling produced in the hands and forearm by the passage of the current. The secret of the anæsthetic effect produced by the electrical current obtained from this apparatus, seems to reside in the extreme rapidity of the interruption. A similar apparatus was exhibited by a member of the American Electro-Therapeutic Association, at its recent meeting in New York City."

Hygiene and Regimen of Rheumatism.— H. Cazalis, according to *La Medicine Moderne*, holds that the rheumatic diathesis is not wholly attributable to general hyperacidity or hyponutrition, but that another factor is required, namely, a special predisposition to irritability existing in the connective tissues, which consequently are the point of least resistance in the system, and become the seat of the disease when certain poisons are introduced into the system or are formed in abnormal quantities. It is held by numerous authors that the connective tissue is the origin of uric acid, — a theory which seems to accord with that of M. Cazalis, since this acid is usually found present in excessive quantities in rheumatics, possibly as the result, as well as a cause, of the irritation existing in the connective tissue. Basing his argument upon the facts and figures presented by the most eminent chemists and physicians, M. Cazalis lays down rules and principles for the government of the diet, a general regimen of the rheumatic, the essential facts of which are as follows: —

1. As regards diet, the author insists that a person with the rheumatic diathesis shall take into his system as little as possible of organic poisons, especially such as irritate the connective tissue. These poisons, it is well known, are particularly abundant in flesh foods, it having been long ago discovered by observing physicians that the cause of the prevalence of rheumatism and gout in England is due, not to wine, as formerly supposed, but to the excessive consumption of flesh food.

2. M. Cazalis believes that a predisposition to irritability existing in the connective tissue may be overcome by the judicious employment of baths, gymnastics, massage, and other hygienic means.

A New Symptom of Bright's Disease.— M. Dieulafoy indicates the existence, in Bright's disease, of various disturbances of the auditory nerve, deafness, roaring in the ears, tingling, sounds of various sorts. It now appears from the observations of M. Bonnier that the ear symptoms of Bright's disease may be manifested not only through the auditory nerve, that is to say, by disturbances of the cochlea, but also through disturbances of the labyrinth, such as vertigo, nausea, vomiting, syncope, apoplectiform phenomena, gyratory movements, and irresistible falling. The symptoms are paroxysmal in character, being generally induced by vaso-motor disturbances of the ear under the influence of uræmia, such as congestion, œdema, etc. These symptoms may be the initial phenomenon of Bright's disease, or may appear later in the affection. When the symptoms are due to renal disease, it resists the usual treatment by quinine, but disappears rapidly under the milk regimen.

For Cracked Nipples.— A. Oehren, an eminent German physician, offers the following as an excellent remedy for cracked nipples: —

Ichthyol, 1 gram, lanoline, 5 grams, olive oil, or oil of sweet almonds, 1 gram.

This ointment immediately diminishes the intolerable pain of nursing. The infant can continue to nurse without injury, as the ointment contains no poisonous substance, and the ointment may be easily washed off with simple water.

A New Dietetic Regimen.—M. Germaine See, of Paris, one of the most eminent of French physicians, has recently called attention to the fact that modern investigations have considerably changed the views of physiologists respecting the proportion of nitrogenous and carbonaceous food elements required for the sustenance of the body. The old theory required 4 ounces of albumen, 1⅓ ounces of fat, and 12 to 15 ounces of carbo-hydrates, for sugar and starch, making, in all, 17 to 30 ounces of water-free food. According to M. Germaine See, "these figures are to-day completely changed, as the result of observation upon different races and physiological experiments; the amount of albumen required, has been reduced one half." The proportion now recognized as necessary for the maintenance of health is: Albumen, 2 to 2⅓ oz.; fat, 2 oz.; starch and sugar, 16½ oz.; or about 21 ounces of water-free food elements.

In reply to the question, What are nourishing substances? M. Gemaine See remarks as follows: "A substance to be nourishing must furnish, in relation to its weight and volume, the greatest possible quantity of nutritive principles. Nutritive principles, as is well known, are themogenic elements. The second condition which must be met by a food is that it shall satisfy taste and hunger without producing too quickly the sensation of satiety. In addition to their nutritive and sensory qualities, foods must possess two other properties, viz., ease of digestion in the stomach, and readiness of absorption in the intestines."

It occurs sometimes that surgeons fail to find the local lesions sought for in trephining for partial epilepsy. The examination of the urine in such cases would have proved the error. It is clinically impossible to distinguish between partial hysterical epilepsy and partial true epilepsy due to the presence of neoplasms. A chemical formula has been used in the service of Mr. Charcot, by which differentiation can be made. In a case of epilepsy due to neoplasms, there is no notable augmentation of the urea and the phosphates in the fixed residues in the urine at the moment of the crisis; in partial hysterical epilepsy, on the contrary, there is a marked diminution of these elements.

Bacteriological Notes.

[The notes appearing in this department are abstracts or translations prepared expressly for the Bacteriological World and Modern Medicine, from original sources.]

Treatment of Osteitis and Tuberculous Arthritis by a Solution of Iodoform in Oil.—Dr. Böhni discovered by accident that iodoform is completely soluble in the oil of sweet almonds, and supposing that the solution of iodoform must be superior to an emulsion for injections, made tests in this line which confirmed his views. Iodoform oil, says the *Archives Medicale Belges*, is clear, and of a yellowish amber color; it can be easily injected with the Pravas syringe without the necessity of employing strong canules, and without the use of anæsthetics, even when the articulations are very sensitive; the pain is insignificant and disappears in one half hour. The results are as good as with the emulsion at least.

The preparation must be made aseptically. For this, prepare the powder of iodoform by washing in distilled water, gather in a filter, and dry in absorbent paper. The sweet almond oil is placed in a sterile dish and heated in an oil bath until it boils; then it is allowed to cool to 100 C., at which time the iodoform, previously weighed, is mixed with it. If the oil is too hot, it will decompose the iodoform. The solution thus obtained will last months if kept in the dark.

After the disinfection of the affected portion, the injection is made at the point where the greatest pain exists on pressure. One syringeful is sufficient, the needle should be inserted quickly and deeply, and the liquid emitted here and there in small quantities in the tuberculous seat; no attention is paid to fistula. The seat of the injection is then covered with sublimated cotton, and cold applications are made upon the articulation. After eight days, the second injection may already be made in the neighborhood of the first, and eight days later, the third, and so on.

If there is an abscess, it should be asperated and the injection made in the abcess itself.

In addition to this treatment the author recommends salt baths with progressive doses of salt. After the bath, massage,

first light and then more energetic, practiced with passive movements. Immediately after these manipulations the articulation is placed in a strong compressive bandage, and the patient is placed in bed for an hour or so. After the second injection the patient begins to try to walk.

Böhni condemns completely the method of tenderness in the treatment of fungosities and arthritis. He says that the more gentle the treatment, the more immobilizing the bandage, the more damaging is the result, and more rapid is the progress of the disease.

According to the author, his method of treatment applies to all ages, the prognosis being more favorable in children. The articulations of the foot and the metatarsal are those which yield more readily to this kind of treatment. Those of the wrist, the metacarpal, also give very good results. Less favorable is the prognosis of the knee in adults. As to white tumors on the hip, the author has treated but one which ended favorably.

Of twenty-eight cases treated by the author, seventeen were completely cured, and ten greatly improved.

A New Chemical Function of the Cholera Bacillus.— M. Ferran has discovered that the comma bacillus, like many others, for instance the bacillus of diarrhœa, the streptococcus scarlatina, and the bacillus coli communis, has the property of producing the fermentation of milk, and causing by this action on the lactose the production of paralactic acid.

The attention of the clinicians is directed to the fact that the bacillus communis which possesses pathogenic functions sometimes very much resembling those of cholera, produces also paralactic acid, and to the fact that paralactic acid paralyzes the chemical effect of both the germ of cholera and of the bacillus coli communis. Inasmuch as this acid is a precious remedy against these diarrhœas, would it not be equally efficacious against the diarrhœas caused by the comma bacillus?

It seems rational to use, in cholera, lactic acid in lemonade, assisting its action by the anexosmotic power of morphine, which would perhaps prevent the absorption of the toxines and prolong the action of lactic acid in opposing its too rapid elimination.

Laparotomy in Tuberculous Peritonitis of Children.— Dr. Aldibert, says the *Archives Medicale Belges*, concludes an article on the above subject as follows: "If we except the intestinal occlusions which must be considered separately, we find that of forty-six cases of infantile peritoneal tuberculosis there were four deaths and forty-two cures, two of which persisted after one year, and two after two years: this gives a death rate of eight and six tenths per cent against ninety-one and four tenths per cent of cures, a quarter of which are definite. The operation caused no death by itself, an improvement always followed laparotomy even in fatal cases. The operative mortality was nil. If we consider the cases of peritonitis recognized as tuberculous by histological and bacteriological tests, we have eighteen cures, of which two continued after one year, three after one and one half years, and one after two years, *i. e.*, one third are assured cures. These figures demonstrate the curability of tuberculous peritonitis by laparotomy.

The Treatment of Actinomycosis. — The treatment recommended by Prof. Thomassen, of the Veterinary School of Utrecht, against actinomycosis is the administration of from six to eight grams (one and one half to two drams) of aqueous solution of iodide of potassium. The treatment has been tried in France, says M. Nocard; M. Godbille, a student of his, has radically cured five patients in less than fifteen days. M. Thomassen counts eighty successful treatments without a single failure. Actinomycosis is very frequent in America; why not try this faithfully?

This, truly, would consist of a specific treatment of actinomycosis in cattle at least; its simplicity and rapidity of action and constant efficacy was the more remarkable that the disease is serious, progressive, and prevents nourishment of the animal. It may be well to try this treatment in human actinomycosis also.

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MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION IN THE CITY OF MEXICO.

THE American Public Health Association held its annual session, according to appointment, Nov. 28, 1892, in the City of Mexico. This is the first time the Association has met within the territory of our sister Republic, although a meeting was held several years ago in the city of Toronto, Canada. The visit to Mexico was made in response to an urgent invitation from the government, conveyed by a delegation of twelve of the leading physicians of Mexico, who were present at the meeting of the Association held last year in Kansas City.

The meeting was pronounced by all the old members present to be one of the most successful which has ever been held. The recognition and support accorded by the government of Mexico, doubtless contributed very largely to the success of the meeting, as did also the generous rates of transportation granted by several of the leading railroad lines in selling round-trip tickets at the rate of one fare. The kindly feeling of the government toward the Association became more and more apparent the moment one found himself across the border and within Mexican territory. Instead of being confronted by Custom House officials eager to explore one's trunks and satchels for contraband articles, the delegates were met by representative Mexican physicians who fairly overwhelmed them with amiable courtesies, conveying a hearty welcome from the President, and the information that the Custom House officers had been instructed to make no inspection of the baggage of the members of the American Public Health Association. This treatment was so different from what most of us had been led to expect by the newspaper accounts, and the statements of some travelers concerning the treatment which foreigners received in Mexico, that all prejudices were at once removed, and the visiting members found themselves prepared for a thorough enjoyment of Mexican hospitality, as well as the scientific program prepared by the officers of the Association. On reaching the city, the members from the United States were met by a large delegation of Mexican physicians, by whom they were divided into parties of three each, with a native physician as a conductor, and escorted to the several hotels where quarters had previously been secured.

The interest of the government in the work of the Association is indicated by the fact that President Diaz was present at the formal opening, and that he invited the members of the Association to be present at his own inauguration, which occurred on the morning of the second day of the meeting, even giving the members precedence before his highest officers in the congratulatory reception which followed immediately after the inauguration ceremony. Every moment of time not required by the regular sessions of the Association, from 8 o'clock in the morning until a late hour at night, was occupied by a regular program of excursions, visits to hospitals and other public institutions, formal and informal receptions, and polite attentions quite too numerous to mention. It is safe to say that no scientific body of men was ever more enthusiastically and more generously received than were the members of the American Public Health Association by the government and the people of Mexico.

READING ROOM

Numerous scientific papers, some of which were of great value as contributions to sanitary science, were read before the Association, although the number of papers contributed was so large that many could not find a place upon the program. Seventy-five papers were contributed by Mexican physicians alone. The great number of papers presented certainly indicates a lively interest in sanitary science, a considerable part of which is due to the excellent work which has been done by the American Public Health Association. The proceedings of the Association for 1892 will be published in both Spanish and English. It is to be hoped that the pleasant affiliation formed between the profession of this country and that of Mexico at this meeting in the City of Mexico, and the discussion of international sanitary questions of great practical interest to both countries, will result in mutual benefit.

Our Mexican neighbors are afflicted with certain endemic maladies, which, while producing less disturbance and less fatality, than typhoid fever and even pulmonary tuberculosis, are likely to extend across the border into the southern section of this country, where they may create general consternation by their fatality and by necessitating a most rigid quarantine, resulting in a complete suspension of commercial intercourse and a consequent enormous pecuniary loss. Yellow fever, or "Yellow Jack," as the disease is familiarly known in the South, is unquestionably the greatest barrier which stands in the way of intimate intercourse between us and the people of our neighbor Republic. If by the study of practical sanitary questions which especially relate to this disorder, yellow fever can be shorn of its terrors, so that our citizens may be led to enter into as intimate commercial relations with Mexico as is the case with Canada, the people of the United States will find in this great country of undeveloped resources a golden opportunity for the inception of great enterprizes of varied character, which will be not only a source of wealth to our citizens, but an untold blessing to the unprogressive and poverty-stricken millions of Mexico. We shall take occasion at some future time to lay before our readers some interesting facts respecting the therapeutic value of the climatic conditions afforded by the great Mexican tableland.

J. H. K.

AN EPIDEMIC OF TYPHO-DIARRHŒAL DISEASE.

A most remarkable epidemic is now raging in the city of St. Louis, Mo., among both young and old, and in all classes of society. The manifestations are decidedly of a character to indicate local intestinal disturbances. The symptoms last for several days, and even weeks, during which time symptoms of a typhoid character appear, and become more or less pronounced.

The object of this notice of the epidemic is not to discuss the pathology of the disease, but rather to point to the condition which produces it. Various hypotheses have been advanced as to the cause, one of which is that the milk supplied to the city is the chief factor, if not the only one, in the production of the malady; another is, that the germs exist in the air; and still another is that they exist in the water in certain localities.

The first opinion is undoubtedly at fault. The disease is general in the city, and not confined to places receiving milk from a particular dairy. It cannot be possible that all the dairies of St. Louis are in the same condition, and that most of the milch cows therein could be under the same influence so that the milk from these sources could be affected in the same way, unless, perhaps, the water and food supply for all of them was identical, which is not the case. It is quite possible, however, that the bad water, of which we will have something to say

farther on, may have an influence in the production of the milk, and cause it to be inferior, if not injurious.

The idea that the cause exists in the air is untenable, as towns and cities in the same altitude and latitude, within a short distance of St. Louis, do not suffer from the same disease.

There remains, then, the opinion that the water is actually the cause of the epidemic. This is undoubtedly true, and one might arrive at this conclusion without making any special investigation. It is only necessary to examine into the general condition of the water supply of St. Louis, to realize that bacteriologically it is most impure.

I am well aware that the chemical condition of this water indicates that it is perfectly wholesome, but in truth it is polluted, and is carried to the homes in this condition. The inhabitants have the idea that its muddy appearance and all its organic and inorganic admixtures constitute a healthful condition, and drink the water without filtration or boiling.

The supply of water for the city, coming from the river, is always a subject of more or less importance. There have existed, this year, however, circumstances which render it much more than ordinarily dangerous. The overflow of the Mississippi River for hundreds of miles each side, extending up almost to its source, and then its gradual receding to the natural channel, have washed the filth of thousands of square miles of land into a common course, whence the city of St. Louis derives its drinking water.

The slow disappearance of the overflow, the long stagnation of the water on the banks of the river, have presented a most efficient medium for the growth of all kinds of micro-organisms, including some capable of producing disease with typhoid and malarial symptoms.

There is no question that the people of St. Louis are suffering now from the result of poisoning by microbes existing in this water, and that many of them have complications from the effect of malarial effluvia which has developed in the neighborhood. It is singular that these facts, so plainly visible, do not alter the routine practice of certain doctors, and change the mind of numerous persons, who still insist that the water is safe; and of certain officials of the city, who, in order to counteract the effect of any admission that St. Louis is not healthy, insist that the drinking water is absolutely pure and wholesome. It would be much wiser and more humane to acknowledge the truth, and use every means to remedy the evil. As a rule, St. Louis water is very healthful, but now a rare condition exists, which renders it dangerous.

The citizens of that city pay for the water they get, and are entitled to the pure article. There is no justification whatever in supplying a beverage which is actually poisonous, and produces wholesale distress and fatalities reaching a high percentage, when it could be prevented.

The condition of this city is one that may arise, and perhaps does exist, in many other cities on the banks of the Mississippi. It is more extensive here, because the whole city population is affected.

P. P.

BROWN-SEQUARD'S ELIXIR.

A FEW years ago the general press of the country, and even the medical press (chiefly the unscientific medical journals, however), used in mockery and buffoonery the respected name of Brown-Sequard, the famous physiologist of the College de France, when he announced the discovery of the stimulating, tonic, and restorative properties of testicular juice. No discovery was ever attacked with such deprecating and unworthy language. Prof. Brown-Sequard, however, fired with enthusiasm to perfect his discovery, as only a scientist may be, never noticed

the scurrilous comments on his name, reputation, and learning. Calm as an enthusiastic scientist can remain under the stimulus of grand achievements, he continued his labor with sublime indifference to the ridicule of his enemies. He seemed bent upon only one thing; viz., to prove the truth of his assertions. The insults thrown in his face only added to his zeal in his work.

Now, Dr. Brown-Sequard is avenged. The truth of his position is proven. The testicular juice is as valuable a therapeutic agent as the discoverer claims. Drs. Lemoine, of Lille, d'Arsonval, of Paris, A., Poehl, of Paris, and numerous other investigators of equal standing and merit in France, Russia, and other countries, have demonstrated the truth of Brown-Sequard's position. Not only that, but following the route indicated by this famous scientist, several other physiological animal substances have been used in injection since, by various experimentalists, with a view to determine their effects as therapeutic agents. Brain matter is among these, and it has been found useful in various forms of neurasthenia, etc. More still, certain chemists, believing the active principle of testicular juice to be spermine, have prescribed the hydrochlorate of spermine in lieu of the animal fluid, and this, too, with remarkably useful therapeutic effects.

Dr. Dupouy, editor of the *Moniteur d'Hygiene Publique*, than whom no more conscientious and independent physician exists in France, uses the following language in defense of Brown-Sequard's discovery: —

"In locomotor ataxia, the efficacy of this medication has also been considerable. Brown-Sequard, in fact, cites the case of an ex-fencing master of a regiment, ataxic and retired from the army as such, who was *radically* cured after a short treatment. To-day, adds our great physiologist, this man gives fencing lessons, and is able to go through with a score of bouts a day. According to the facts verified by himself and by Dr. d'Arsonval, it is possible to-day scientifically to formulate the following conclusions upon the therapeutical action of the testicular juice matter. The latter, injected in cases of enfeebled old people, rapidly gives them back their strength in durable and definite proportions. In locomotor ataxia, tuberculosis, anæmia, and other analogous morbid states, this agent tones up the general state of the health, strongly aids resistance to disease, and brings on a fine convalescence.

"Moreover, Brown-Sequard, in order to demonstrate, by an argument *ad hominem*, the value of his liquid, tries his strength *before his colleagues* on a dynamometer, and the instrument records a muscular strength of 45 kilogrammes. It must be well borne in mind that our learned physiologist is over seventy-five years of age, and that very strong and very vigorous men only succeed in recording on the dynamometer a force of from 40 to 41 kilogrammes [?]. This is, now, the answer given, for the second time, to the skeptics and the guardians of the capital of the academies, ever contemptuous of everything which does not come from the laboratories of their masters, and refusing to test the experiments of the College de France.

"The Brown-Sequard injections may at present be considered as constituting one of the most brilliant discoveries of modern therapeutics."

P. P.

Four years ago the writer had the pleasure of spending a little time by special invitation with Dr. Brown-Sequard in his private laboratory in Paris. His statements respecting his wonderful improvement in strength, freshness, and vigor were confirmed by his assistant, Dr. Henrocque and by his appearance. He is certainly a man of keen perception and undoubted veracity. His mother was an American woman.

J. H. K.

IS ASEPTIC SURGERY POSSIBLE?

BUDINGER has recently made some experiments in Billroth's clinic for the purpose of determining the relative value of various methods of wound treatment, and the author concludes, as the result of his observation, that it is impossible to treat wounds in such a manner as to keep them absolutely free from microbes. He says, "No method has been devised to prevent the fall of microbes upon the wound during the operation, or to kill them and prevent them from developing." The author's experiments were made with staphylococci albus, aureus, and citreus, all of which were found to be virulent.

These views of the author seem to be somewhat extreme, as we think it just as possible to open the skin without inoculating the tissues underneath it, as to open the test tube containing sterilized culture media without inoculating the same. Operating in an atmosphere free from microbes, with sterilized instruments, and with hands, clothes, and everything about the person made absolutely free from microbes by sterilization, it certainly seems to me to be possible that an operation wound might be made and closed without infecting the tissues with air germs. That conditions sufficiently perfect to insure absolute asepsis are rarely secured, must be admitted. Certainly, surgeons are indebted to the germicidal properties of the living tissues for most of their cases of wound union without suppuration.

The observations made by Budinger, even if his conclusions be admitted, do not in the slightest degree lessen the importance of the aseptic methods which are the special characteristics of modern surgery; for it will be readily admitted that the tissues are better able to defend themselves against a small number of germs than against a multitude. But in the opinion of the writer, the effects of these observations should be, not to discourage attempts to secure absolute asepsis, but to emphasize the importance of devising a more effective and thoroughgoing means for excluding aseptic microbes from operation wounds.

A method employed by the writer for a number of years, and, as he believes, with good results, has been the use of an air filter connected with a fan run by an electric motor, by means of which a current of germ-free air is passed over the field of operation during the entire operation. The same apparatus is used to free the air of the operating room from dust. The effectiveness of the apparatus has been very well shown by the accumulation of dust on the inside of the filter, and by the fact that potato cultures can be readily exposed for a long time in the current of air which is passed through the filter, without becoming infected.

J. H. K.

Papoid in Dyspepsia.— A. J. Park, M. D., of Chicago, has recently published a small series of cases which are illustrative of the good effects derived from the use of carica papaya in functional disorders of the stomach. The three cases described were all manifestly benefited by the use of the remedy, although other rational means were used at the same time. Most of these patients had tried a great variety of remedies before, however, without benefit, so that Dr. Park felt justified in giving papoid credit for the remarkable improvement observed. No analysis of the stomach fluid was made in these cases, and so it is not possible to state exactly what was accomplished by the papoid, which would certainly be very desirable; but its empirical use seems to have been attended by good results. There are doubtless cases in which this remedy is valuable, although the number of cases in which the nature of the stomach disorder is a deficiency of pepsin is very small indeed, compared

with the number in which the disturbance is due to an excess or deficiency of some of the other elements of the digestive fluid. In a careful study of 261 cases by exact chemical methods, a deficiency of pepsin action was found in only 44 cases, or 16.8 per cent of the total number of cases studied. The writer has given elsewhere a careful analysis of the results found in the analysis of several hundred stomach fluids, as regards variation in the proportion of normal elements and the presence of abnormal elements. Nearly all observers who have studied stomach liquids by modern chemical methods, agree that a deficiency of pepsin is not the most common of the morbid conditions present in functional disturbances of the stomach; nevertheless, there is a certain proportion of cases in which this deficiency does exist, and for such cases papoid seems to be a most valuable remedy. It is absolutely free from foreign ferments, being of vegetable origin, and does not produce the toxic substances which are sometimes found accompanying peptic digestion,— probably in cases in which the pepsin employed is impure, and hence sets up putrefactive processes in addition to peptic digestion.

J. H. K.

How Cholera Attacks the Human Body, and How to Prevent It.— The comma bacillus is the cause of Asiatic cholera; all other germs found with it in cases of cholera are merely associates, which may or may not be harmful. The bacillus coli communis, as well as other microbes sometimes found associated with the comma bacillus, or which produce by themselves some diarrhœal or choleraic symptoms, are individually and collectively incapable of producing Asiatic cholera, although it must be admitted that they sometimes produce fatal disease, either by their individual or combined action, or in complicating the effect of the true germ of cholera.

From this basis, it must be apparent to all that the essential point in the prevention of cholera is to prevent the germs from entering their feeding grounds in the system. The comma bacillus is never found in the blood, the glands, nor in any part of the organism, except the alimentary canal. Preventive measures, then, must be directed against the introduction of this parasite by the mouth (and perhaps the nose), through which it must travel to reach the bowels before it can do any pernicious work.

The germs of this fatal malady travel from place to place by means of the body, particularly the dejecta. No atmospheric influence nor combination of atmospheric or telluric conditions, could spread the malady. When transported from its home in Asiatic lands, it follows commercial channels, being carried in the body, in the clothing, or by means of various things to which the germs may be attached or with which they may be mixed. It spreads from individual to individual in a community, by means of the ingestion of germs in water, milk, and other articles of diet.

It follows, then, that, first, general sanitary measures must be enforced against the introduction of the disease from foreign lands by means of persons traveling and by commercial intercourse; secondly, every home should exercise prudence and institute means to prevent the access of dangerous food, clothing, etc., into their families; thirdly, and most important of all, every one should follow rules for self-protection,— a sort of sanitary system to insure against the invasion of the alimentary tract by the comma bacillus.

It would be interesting to map out the various practicable methods of general and special sanitation, but this would carry me too far in this article.

The chief question for each individual to consider, in this matter as in all diseases, is "self-defense." To succeed in this, one need only eat nothing raw, but

have all his food cooked; water, milk, fruits, and every article of diet should be thoroughly cooked. Besides this, the body, and particularly the mouth, nose, and hands, should be thoroughly disinfected with some antiseptic wash (carbolic acid, boracic acid, and thymol, for instance). As in all intestinal germs capable of disturbing the food and the dejecta in the bowels, the comma bacillus thrives best in overloaded stomachs and bowels, in intestines replete with rich and indigestible foods, and in organisms in which nature's own powers of fighting germ life and resisting disease have been weakened by wrong living, dissipation, etc. Temperance in all things, regular habits, absolute cleanliness, and disinfection are the necessary conditions to save individuals from cholera in an infected district. P. P.

Reviews.

Diseases of the Lungs, Heart, and Kidneys.—By N. S. Davis, Jr., A. M., M. D., Professor of Principles and Practice of Medicine, Chicago Medical College; Physician to Mercy Hospital; Member of the American Medical Association, Illinois State Medical Society, Chicago Medical Society, Chicago Academy of Sciences, Illinois State Microscopical Society; Fellow of the American Academy of Medicine; Author of "Consumption, How to Prevent It, and How to Live with It," etc. *No. 14 in the Physicians' and Students' Ready-Reference Series.* In one neat 12mo volume of 359 pages, extra cloth, $1.25 net. The F. A. Davis Co., 1231 Filbert St., Philadelphia, Pa.

This is a most valuable addition to the Ready-Reference series of medical works at the command of the medical profession. Being the essentials of lectures delivered by the author at the Chicago Medical College, they constitute a more useful book of reference than the usual abbreviated and condensed text-book. Dr. Davis, Jr., has already made a name for himself, and his works are worth the most careful consideration.

Tuberculosis of Bones and Joints.—By N. Senn, M. D., Ph., D., Professor of Surgery in Rush Medical College, Chicago, Ill. The F. A. Davis Co., Publishers, 1231 Filbert St., Philadelphia, Pa.

Like all that Dr. Senn writes, this work is concise, clear, and practical. It is an admirable résum of modern ideas on tubercular disease of the bones and joints, and the most approved and recent of surgical treatments. Much of this very desirable treatise consists of the experiences of the author himself, whose surgical skill and medical knowledge are surpassed nowhere in this or foreign countries. The book is a large 500-page volume, and contains 107 practical illustrations. No practitioner can well afford to be without this splendid collection of authoritative surgical and medical ideas on the subject of which it treats.

The Physician's Visiting List.—Lindsay & Blakiston, Philadelphia; P. Blakiston, Son & Co., Philadelphia, publishers, $1 to $3.

No better recommendation of this exceedingly useful little volume can be given than that it has been published yearly for forty-two years. It is a neat little pocket memorandum book of the greatest practical value to the medical practitioner. It has a visiting list for every day in the year, want memoranda, record of obstetrical cases, record of deaths, etc., all things of every-day necessity. When we consider in addition to this the many excellent suggestions in cases of emergency, such as poisoning, drowning, and also the list of new remedies, the metric system, the rule for examining urine, etc., it is apparent that Blakiston's visiting list is a requisite for the doctor's outfit for the practice of medicine.



WHERE TO SPEND THE WINTER!

AT THIS SEASON OF THE YEAR THOUSANDS OF INVALIDS ARE SERIOUSLY CONSIDERING THE QUESTION,—

WHERE CAN I SPEND THE MONTHS OF **November, December, January, February, AND March,**

WITH THE GREATEST PROFIT?

THE ANSWER to this question will depend upon what the individual wishes to accomplish by a sojourn away from home. If rest and recuperation are the chief requirement, the Southern and Pacific Coast States offer numerous attractions which draw throngs of semi-invalids and valetudinarians every year.

If, in addition to rest and recuperation, the invalid needs a careful study of his diseased conditions, and an intelligent regulation of diet, exercise, and all other health conditions,—in other words, scientific health culture, efficiently carried out by the aid of the best known medical means and appliances, thoroughly trained nurses and attendants, and competent physicians,—then the choice between the most desirable places becomes very much restricted. There are certainly few institutions in this country where the needs and desires of an earnest, health-seeking invalid can

be satisfactorily met. Such places can be counted on the fingers of one hand, and are, perhaps, little known because of the fact that the managers of such institutions are conducting them in a scientific, and in some instances a philanthropic spirit, and consequently do not employ as a means of winning patronage, the emblazoned advertisements, the truth-sacrificing circulars, and other advertising methods commonly resorted to by the proprietors of mineral springs establishments, bogus sanitariums, and other so-called "health institutions" and quasi-medical establishments, with which the country abounds.

The advertisements of these establishments do not appear in public prints or popular magazines because such advertising is closely akin to quackery, and brings those who employ it into bad company.

The managers of the Sanitarium at Battle Creek, Michigan, many years ago undertook to organize a thoroughly scientific institution which would represent rational medicine in its most advanced form, and would be exactly what it professed to be — an institution where patients are honestly and fairly dealt with, treated at reasonable rates, given kind attention and comfort, and opportunity for the recovery of health under the most favorable conditions. The majority of patients treated in this institution are sent to it by physicians who by personal acquaintance, or through the reports of their patients, have become thoroughly familiar with the character of the institution and its management.

BRIEF DESCRIPTION OF THE Sanitarium.

BATTLE CREEK, one of the most beautiful and prosperous cities of Michigan, is centrally located in the salubrious Peninsular State. Its population is 20,000, while its death rate is but seven per thousand. Battle Creek is situated on two great thoroughfares of railway travel between the East and the West, being at the junction of the Grand Trunk and the Michigan Central lines; and two other railways make it easy of access from the South.

The city has an electric railway and is lighted by electric lights. A great number of pleasant drives are afforded by its well-kept and shaded streets.

The Buildings are lighted by a 700-light plant, Edison incandescent system.

Safety Hydraulic Elevators. Outside stairways for fire escapes accessible from every window.

The Institution affords facilities for baths of every description: Turkish, Russian, vapor, electric, water baths of all kinds, and the electric light bath. Independent accommodations for ladies and gentlemen, sufficient for 80 persons at one time. More than 800 feet of glass for sun baths.

A General Parlor, 40 x 50 feet, is luxuriously furnished with Dhagistan rugs, easy chairs, etc. The Dining-Room has a seating capacity of 400, is beautifully lighted and ventilated, and always cheerful. No kitchen smells. Cuisine unsurpassed; table service excellent. Everything an invalid needs, and special dietaries prepared as directed.



THE CONSERVATORY.

The Gymnasium, 85 x 45 feet, is supplied with every appliance for exercise, and furnishes special instruction and class drills in Delsarte and Swedish gymnastics, under a trained director. Exercise by prescription.

The Swedish Movement Department, both manual and mechanical, is the most extensive in the United States. Vibrating bars and seats, kneaders, rubbers, beaters, shakers, and manipulating appliances of all sorts.

The Electrical Department contains every improved appliance for medical applications of electricity, Galvanic, Faradic, Dynamic, and Static electrical apparatus and appliances for electrolysis, electro-cautery, etc.

An Aseptic Maternity on the cottage plan (steam heat and thorough ventilation), provides the best possible conditions for lying-in patients, with experienced professional attendance and rigorous aseptic management.

Special Departments for surgical cases, eye, ear, throat, and lung diseases, nervous diseases, genito-urinary diseases of men (non-specific), opium and alcohol habits, and diseases of women. A kindergarten and nursery, to keep the children happy and out of mischief.



SUMMER HOUSE AND FRESH-AIR INLET.

Three Fine Greenhouses, maintaining a magnificent collection of palms and various tropical flowers and plants, keep the house filled with bloom during the winter season. Flowers are everywhere indoors during the winter season. Patients can visit the greenhouse at any time without going out of doors.

Glass-Inclosed Sun-Parlors and Verandas for winter sunning and promenading.

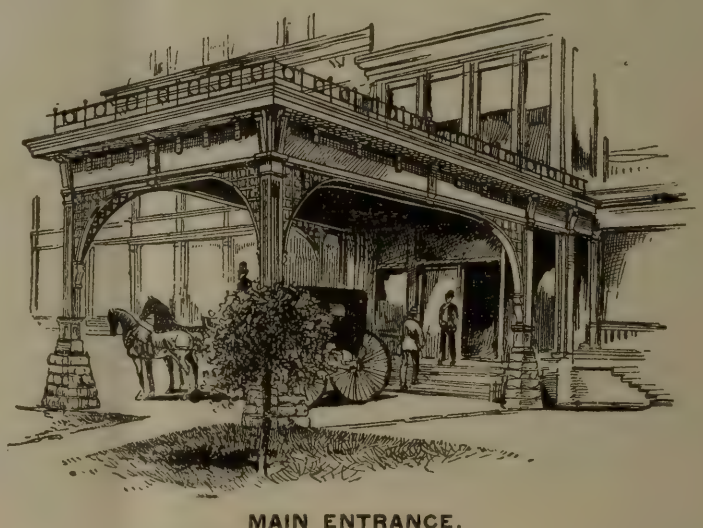
Pure Water from sandstone rock.

There are from 250 to 300 Employes in the Sanitarium service the year round, of whom from 90 to 100 are medical attendants and nurses. Also seven thoroughly trained physicians, and a large corps of manipulators skilled in massage and the Ling system of Swedish movements.

The Sanitarium Training-School, in which our nurses are trained, is the largest and most popular in the United States. Its course of training is the most complete and thorough of any school.

Tri-Weekly Lectures on popular medical subjects by the physicians.

Abundant Means for Recreation indoors during inclement weather. Facilities for walking, driving, and horseback riding at all seasons.



MAIN ENTRANCE.

The Sanitarium is Not a Pleasure Resort nor a fashionable hotel, but an ideal place for invalids needing good nursing, the benefits of regular habits, and scientific professional care and treatment, and who desire to become permanently well.

The Sanitarium Nursery and Kindergarten. This enables mothers to bring little ones with them without being burdened with their care and supervision. The children have the advantages of kind and experienced teachers and ample playgrounds.

For Further Particulars, see large circular and card of rates.

J. H. KELLOGG, M. D., SUPT.,

Sanitarium, BATTLE CREEK, MICH.

THE LABORATORY OF HYGIENE.

(SANITARIUM.)

J. H. KELLOGG, M. D., Supt. PAUL PAQUIN, M. D., Director.

MONTHLY BULLETIN.

BATTLE CREEK, MICH., NOV. AND DEC., 1892.

THE ACID OF THE GASTRIC JUICE.

(Concluded.)

LAST month the writer presented the results of the quantitative analysis of 413 stomach fluids as regards the presence or non-presence of hydrochloric acid, and the presence or non-presence of lactic acid in 328 stomach fluids. Some further observations respecting the relation of free hydrochloric acid to digestion, which seem to be worthy of record, have been made and are here given:—

3. *Observations Respecting the Effect of the Addition of Free HCl to Meat Juice.*—The fact that free hydrochloric acid is not found in the gastric juice of dogs that have been fed upon meat, has been used as an argument against the theory which regards this acid as an essential constituent of healthy gastric juice. Hayem and Winter some time ago suggested that this fact might be due to the combination of free hydrochloric acid with the albuminous elements of meat, thus causing the disappearance of HCl in a free state from the gastric fluid obtained from the stomach of a dog during the digestion of flesh food. The following experiment, a modification of an experiment made by the authors above referred to, seems to demonstrate this hypothesis to be correct:—

A quantity of meat juice was expressed from fresh beef, and titrating with a decinormal solution of hydrate of potash, its acidity was found to be equivalent to .021 grams of anhydrous HCl. A solution of hydrochloric acid was then added drop by drop to an equal quantity of the same preparation of meat juice, testing frequently for the presence of free HCl. No indication whatever was obtained until after .015 grams of anhydrous HCl had been added. A faint indication of the presence of free acid was then obtained with Congo-red paper. The solution was then titrated with a decinormal solution of KHO, and its acidity was found to be an equivalent of .035 grams of anhydrous HCl, showing that the HCl added had not been neutralized by any alkaline substance in the meat juice, but that it had been simply fixed by the albumen with which it had formed an acid combination, it still retaining its acid function to the full degree.

This experiment explains very completely the absence of free HCl from the gastric juice of the dog during the digestion of meat, and of course answers completely the argument based upon this fact.

4. *Therapeutic Observations Respecting the Influence of Lactic Acid upon the Digestive Process.*—I have made a very considerable number of observations respecting the influence of lactic acid upon stomach digestion. Having noted the frequent absence of lactic acid in cases of hypochlorhydrie, lactic acid being noted as absent n 25 (61 per cent) of the 41 cases of hypochlorhydrie,—cases in which free HCl is present in the gastric juice in abundant quantity, but fails to combine with albumen to the usual extent, or, in other words, in which there is a deficient amount of useful work done by the stomach,—it occurred to me to be possible that the qualitative change in the character of the chemical work done by the stomach might be due to this notable deficiency of lactic acid, which previous experience had taught me to be useful in certain cases of dyspepsia, although I had not before been able to predict in advance just which cases would be benefited by the remedy. I accordingly began the administration of the lactic acid in doses of 5–15 minims of pure acid in cases of this class, and with most excellent results, as will be seen by the following case, which is a fair example of many others which might be cited:—

A young man aged 30, a student, had suffered for eight or ten years from stomach disorders which had been but partially relieved by the various remedial measures which he had employed. Was emaciated, and suffered much from sour stomach. Appetite was good, but the nutritive processes were evidently very defective, for he was continually emaciated and weak, and unable to pursue his studies except under great difficulty.

Analysis of the stomach fluid gave the following quantities: (A) .217; (*a*) 1.00; (T) .354; H .090; (C) .120.

Formula: —

$$A + a + T + \left.\begin{matrix} H & + \\ C & - \end{matrix}\right\} =$$

The above figures indicate hyperpepsia with hyperchlorhydrie, hyperacidity, and acid fermentation. The amount of free hydrochloric acid is notably large—nearly double the maximum quantity found in health; but fermentation existed notwithstanding the presence of this large quantity of free HCl, a circumstance which I have observed in many other cases. The patient had occasionally found relief by the use of lacto-peptine. At my suggestion, he discontinued the use of this remedy, and used lactic acid instead—5 to 10 drops immediately after each meal, sometimes repeating the dose one half hour to one hour after the meal. September 7, 1892, a month after the first analysis, another test breakfast was taken, and the following figures were obtained: (A) .188; (*a*) .81; (T) .284; (H) .020; (C) .204:

Formula: —

$$A = a = T - \left.\begin{matrix} H & - \\ C & + \end{matrix}\right\} =$$

Uffelmann's test for lactic acid gave no reaction. Peptones abundant. This formula indicates simple dyspepsia with slight deficiency of free HCl, without acid fermentation. It is interesting to note that under the influence of the lactic acid the excessive secretion of chlorine had disappeared, the fermentation ceased, and the large quantity of free HCl which remained in the stomach unused, was made to combine with the albumen, and thus enter into the useful chemical work of the stomach. The excess of the combined albumen (C) cannot be considered a pathological condition in this case, as it only indicates the effort of nature to supply the extra quantity of nutritive material needed for promoting a gain in flesh. Under the influence of this simple remedy alone, having made no change whatever in his diet, the patient had gained several pounds in flesh, and was so greatly improved that he considered himself practically well.

Similar observations respecting the therapeutic value of lactic acid have been made in a large number of cases, with equally good results.

I consider myself justified in asserting with confidence that lactic acid may be depended upon as a remedy that would favorably influence the chemical processes of digestion, certainly in improving the quantity of the chloro-organic combinations, and possibly also in influencing the combination of chlorine with albumen, and perhaps the setting free of chlorine from the bases.

INVESTIGATION OF CONTAMINATED DRINKING WATER.

During the last month, considerable attention has been given to the examination of drinking water, as the result of an outbreak of typhoid fever involving a number of persons in the same family. The work has been done by Mr. F. E. Braucht, one of the assistants in the laboratory. A sanitary inspection of the premises on which the outbreak occurred was made, with the following results: —

The well is situated on a ridge, the surface soil of which is sand and gravel. It is driven to a depth of nearly a hundred feet, and in its course passes through nearly fifteen feet of hardpan and solid rock. One would naturally think that such a well would contain the purest of water, but not so with this. Within a distance of twenty to forty-five yards are five deep privy vaults, and near by a hencoop contributes its portion of bad hygiene. The slops from the house are also thrown out immediately around the well.

With the sample of water brought me, I injected two rats hypodermically, at the root of the tail, one with 3 c. c., and the other with 6 c. c. After two days, both rats showed signs of illness, and on the third day refused to take food. On the ninth day after inoculation, the rat inoculated with 6 c. c. of the water died; the other was sick for some time, but finally recovered.

Post-mortem examination showed the liver, kidneys, and spleen to be congested. The spleen was dark colored. The small intestine showed signs of inflammation, and dropped to pieces upon the slightest pressure.

Culture made upon gelatine showed a whitish growth upon the second day, very much the same as Eberth's germ. Microscopical examination showed a small bacillus, a little smaller than Eberth's bacilli, and a few micrococci.

Culture upon potato grew with an invisible growth, except a few colonies of white mold.

Culture in sterile milk after a week's time turned the bacillus a greenish yellow, and thoroughly digested it.

Three cubic centimeters of a thirty-six hour culture of bouillon, injected hypodermically at the root of a rat's tail, killed him in less than twenty-four hours. The same culture left to stand a few days, had almost the same appearance as sterile bouillon, but upon the slightest agitation turned a dark green, which disappeared again upon standing. The odor from this culture was very disagreeable.

Chemical examination of the water was as follows:—

Hardness, before boiling, 8°.

Hardness, after boiling, 5½°.

Odorless and tasteless at a temperature of 30°–40° C.

Chlorine, 32 parts per 1,000,000.

Free ammonia, 80 parts per 1,000,000.

The physician who sent in the sample of water, informed me that in the latter part of July a young lady who had been away, returned home, and in a few days was taken with typhoid fever. She lived near the well, and used the vault forty yards away from it. This was the first case that occurred; but from that time until the water was brought for examination, there had been six or more cases of typhoid fever among those using the water from that well. The use of the water was stopped, and no more cases have developed.

TECHNIQUE.

The Absence of Hydrochloric Acid.— Ewald claims, in his work on Diseases of the Stomach, that in "menstruation, no free hydrochloric acid, or only a very small quantity, is secreted," supporting his statement by the authority of Kretschy, Fleischer, and Boas. He also claims to have found complete and permanent absence of free hydrochloric acid in a number of persons who had no stomach complaints, from which he concludes that "no positive diagnostic value" should be attributed to an increase or diminution in acidity which is referred to free hydrochloric acid, in which we suppose he also includes the compound chlorine or chloro-organic substances, which, in the determination of acid by acidimetry, behave precisely as does free hydrochloric.

From the observations which we have made upon stomach liquids, and the results of experiments which we now have in progress, we are inclined to the opinion that these conclusions of Dr. Ewald are not well grounded, or, at any rate, that the number of healthy persons whose gastric fluid does not contain free hydrochloric acid, is much smaller than he supposes.

(To be continued.)

A New Mode of Staining Spores.— Möller recommends the following method for staining spores, which is excellent in its results:—

The preparation on the cover-glass is passed three times through the blaze, or placed two minutes in absolute alcohol, then two minutes in chloroform, and washed in water. It is then plunged from one half to two minutes in chromic acid of 5 per cent, washed again thoroughly, covering the glass with a drop of solution of phenicfuchsin, and is then carried to ebullition in the flame during sixty seconds. Once the fuchsin is evaporated, the cover-glass is decolorized in a sulphuric acid solution of 5 per cent and again washed in water. It is at last left for thirty seconds in an aqueous solution of methyl-blue or of malachite green, and washed. The spores then appear a dark red, while the body of the bacteria is colored a beautiful green.

Anise Oil as an Imbedding Material for the Freezing Microtome.— Good imbedding material is one of the most difficult things to obtain in microscopy, and it is always interesting to the microtomist to find some new methods promising one more satisfaction than what has been tried. The following, from the *International Medical Magazine*, abstracted from the *Centralblatt. f. Bakteriol. u. Parasitenk.*, will be read with pleasure:—

"Kühne, of Wiesbaden, after commenting upon the fact that in using the freezing microtome, if the tissue be frozen completely, the knife is very apt to ride over it and cut a section of uneven thickness, and that when the freezing is of the degree most favorable for cutting, the tissue is apt to become separated from the freezing plate; suggests that this difficulty may be obviated by substituting anise oil for water, the former becoming solid at from 6° to 18° R. (45.5° to 72.5° F.). In course of time, from exposure to the oxygen of the atmosphere, lower temperatures may be required to solidify the oil; but when it is fresh and pure, it congeals almost at the ordinary temperature of the room. A small bit of the tissue, about an eighth or a twelfth of an inch in thickness, is placed in the oil, after careful hardening in alcohol. In about twelve or twenty-four hours it is thoroughly impregnated with the oil, the clearness of the specimen being regarded as the test. The plate of the microtome is carefully cleaned and wiped off with a rag wet with alcohol, and dried; a few drops of the oil are placed upon it, and upon this the bit of tissue to be frozen. A few pumps upon the ether-spray apparatus suffice to solidify the mass, and sections may be made. From the knife the frozen sections should be placed in a dish containing alcohol, to remove the oil, care being taken to prevent contact of alcohol with the imbedded mass on the microtome, as it would thus be dissolved and the tissue loosened from the freezing-plate. The further preparation of the specimen rests with the operator, excellent results in staining of both tissues and bacteria being possible, with ordinary care."

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Sole Agents and Sole Licensees for the United States

ARISTOL is now widely used as an agreeable and effective dressing in all of the operations of major and minor surgery and in dentistry. It is invaluable in ulcerations of all kinds, and in burns, blisters and bed-sores. It adheres closely to mucous membranes and wound surfaces. (*Aristol and "Europhen-Aristol" a combination of both remedies, are supplied in ounces.*)

EUROPHEN is a complete substitute for iodoform and is a cicatrisant, of special value in specific lesions, catarrhal and ulcerative diseases and all surgical conditions formerly treated by the latter preparation. It has five times the covering power of iodoform and forms an impervious coating over denuded tissues. Europhen has a faint, agreeable odor resembling that of saffron. (*Supplied in ounces.*)

SALOPHEN is a new salicylo-phenolic derivative said to be so combined, chemically, as to constitute a safer and more effective remedy than either of its components, or any analagous preparation. The reports refer in the highest terms to its value in acute articular rheumatism and allied affections. Competent observers recommend it for trial. (*Supplied in ounces, tablets and pills.*)

SULFONAL induces physiological sleep, free from narcosis, and without sequelæ. It acts purely as a hypnotic and claims no analgic powers. Sulfonal is also of the highest value in the neuroses and is largely employed by neurologists. It is a perfectly safe and reliable remedy and its continuous use does not give rise to a drug habit. Sulfonal must be administered according to directions. (*Supplied in ounces, tablets and pills.*)

PHENACETINE continues to justify the high commendations of physicians, and it may properly be considered as the best of the modern antipyretics and anodynes. In *la grippe*, rheumatism, migraine, neuralgia and allied maladies it is a prompt, safe and effective remedy. Phenacetine, unlike the secret mixtures announced as analgesics and antipyretics, is a true organic derivative. (*Supplied in ounces, tablets and pills.*)

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